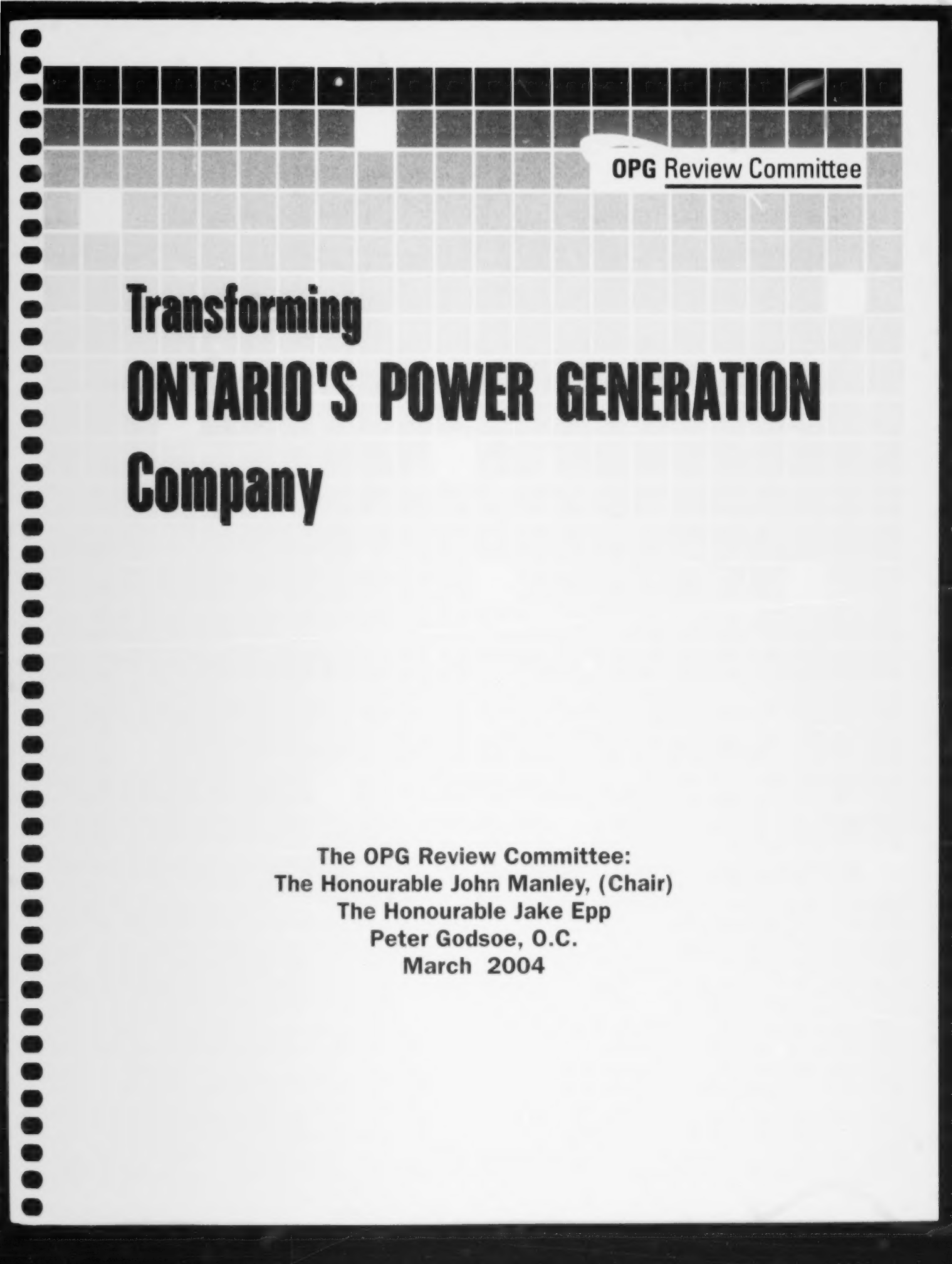




OPG Review Committee

Transforming ONTARIO'S POWER GENERATION Company

**The OPG Review Committee:
The Honourable John Manley, (Chair)
The Honourable Jake Epp
Peter Godsoe, O.C.
March 2004**



OPG Review Committee

March 15, 2004

The Honourable Dwight Duncan, MPP
Minister of Energy
4th Floor, Hearst Block
900 Bay Street
Toronto, Ontario

Dear Minister:

In accordance with your direction of December 16, 2003, we have the honour of presenting to you our report on the future role of Ontario Power Generation Inc. (OPG) in the electricity sector; the future structure of OPG; the appropriate corporate governance and senior management structure; and the potential refurbishing of Pickering A Units 1, 2, and 3.

We would like to thank the many people who helped us to better understand the complex issues surrounding the current circumstances of OPG, the Pickering Return to Service Project and the Ontario electricity sector in general.

We would particularly like to thank the staff members from across the Ontario Public Service who provided support in the areas of logistics, research and public policy advice.

Respectfully submitted,

Original signed by

The Honourable John Manley, P.C., M.P., B.A., LLB, Chair

The Honourable Jake Epp, P.C., B.A., B.Ed., LL.D.

Peter C. Godsoe, O.C.



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Introduction

Ontario's electricity system is increasingly fragile. On the hottest and coldest days, people worry if there will be enough power. The province relies more on imports than ever before. The system of wires, transformers and towers that brings us electricity is pushed to near capacity. Three nuclear generating units owned by Ontario Power Generation Inc. (OPG) lie idle – and faith in its ability to return them to service has been shaken.

While there are many reasons for these problems, two stand out. First, the sector has been destabilized by more than a decade of abrupt and often unpredictable policy swings. That turmoil took the attention of key players away from long-term supply and transmission needs. It also created an environment that threatens the operational and financial health of OPG.

Second, and equally significant, are problems within OPG itself. As our largest electricity generator, its troubles both reflect and contribute to the fragility of the sector as a whole:

- Senior management has changed frequently, often in step with policy changes that have shifted the company's focus from its core job of generating electricity.
- Accountability and governance have been weaker in many areas than they should have been, and the culture is marked by low morale and a low sense of worker engagement.
- Cost overruns and delays in returning Unit 4 at the Pickering A nuclear station to service and unplanned costs at other stations have bled billions of dollars from the company since 1999 and reduced the supply of electricity.

In sum, OPG looks, to people on the inside and outside, like a company that is neither well run nor well governed. It is not getting the value it could and should be getting from its assets – whether physical assets like generating plants, or the human capital of its workforce.

In light of these concerns, Ontario's Minister of Energy announced on December 16, 2003 the creation of the OPG Review Committee. Its members, drawn from the public and private sectors, were asked to provide the Province with recommendations on how to fix what is wrong at OPG. Appendix A provides brief biographies of the committee's members.

The specific areas we were asked to advise on may be summarized as:

- the future role of OPG in the electricity market;
- the future structure of OPG;
- the appropriate corporate governance and senior management structure; and
- the potential refurbishing of Pickering A Units 1, 2 and 3.

This report provides our recommendations and advice to the Minister in these areas. While we were not asked to make recommendations on the appropriate structure for the electricity sector as a whole, we do make a number of observations on this broader issue.

The complexity of the issues and the sheer size of OPG made this an extremely challenging task. We felt very strongly the need to get it right – not just for OPG but for everyone in Ontario. Getting it right is critical, because:

- The generating assets owned and operated by OPG are capable of providing more than 70% of our electricity supply, so their role is vital to Ontario's economy and quality of life and to keeping our supply reliable and competitively priced.
- Ontario faces a potential supply shortage of between 5,000 and 7,000 megawatts (MW) by 2007 – or about 16 to 23% of Ontario's current capacity – and to worsen steadily from there on. Decisive action is needed now to head off the crisis.
- OPG, in the current environment, risks becoming a further burden on ratepayers or a drain of tax dollars. This can't be allowed to happen.
- Finally, OPG and its predecessor, Ontario Hydro, have been through too many false starts over the past decade. People in Ontario and at OPG need a better solution.

How did we proceed?

Our starting point was the need to ensure the publicly owned assets that form the backbone of Ontario's electricity supply – from the historic Beck station at Niagara Falls to its huge and complex nuclear stations – are run and maintained as well as can be.

This is a critical stewardship role, and our first question was: who should be entrusted with it?

There are those who would argue that OPG's problems are so severe that it is no longer capable of handling the complexities of running and maintaining one of the largest portfolios of generating assets in North America.

We took a hard look at the company – not just its present condition, but also the history of its problems and the future performance it might be able to achieve.

We looked to the assets themselves, and our dependence on them no matter in whose hands they are.

In the end, we decided that OPG should continue to play its role as the owner and operator of these assets. There are strong reasons for our decision:

- Policy chaos and poor governance have not allowed OPG to perform to its potential.
- Public-sector and private-sector ownership both present risks. At present, we believe the risks related to keeping OPG's assets in public hands are easier to manage. We have recommended ways of doing this.
- For the foreseeable future, the Province needs to maintain, in the public sector, core expertise in operating and maintaining generating assets.

In short, we believe that OPG has a vital role to play in ensuring the best use of public assets to meet critical needs in an evolving sector. This does not preclude it from entering into arrangements with other parties to ensure that its assets are put to their best use. Our

full rationale, and a more detailed description of OPG's proposed role, are set out in Chapter II.

We need to underscore, however, that we are not proposing to go back to the old days of one supplier to almost all of Ontario's market. That model may have worked well in the past, but the world has changed.

Now we have – and need – an array of increasingly sophisticated options to meet demand: distributed generation that puts generating capacity close to where it is needed, conservation, renewable energy and co-generation.

This has created a different landscape for the sector that offers opportunities for many different players. We certainly see a role for OPG, but it must be one of many suppliers offering a diversity of generating sources. Its size and structure must not work against other market players.

This leads us to three principles that will help to define the outcome that is best, in the current environment, for Ontario:

- OPG remains a government-owned company;
- OPG is given the tools and mandate to become an effective steward of public assets; and
- OPG is one of many suppliers to the Ontario grid.

To work, this needs a policy framework that properly fits OPG into the new landscape for the sector.

Specifically, OPG must become a rate-regulated commercial utility focused on running and maintaining its core generating assets. ("Rate regulation" and other technical terms used in this report are defined in Appendix D.) OPG also needs a structure and governance framework that let it operate like a commercial business.

This requires that the government must act as a responsible shareholder, the company must run like a commercial business, the policy environment must allow the market to bring in new players – and everything must be open and transparent.

Get that right and the rest should follow. We believe our recommendations comprise a realistic plan for getting it right.

Removing the obstacles

We expect that there will be understandable cynicism about yet another "plan" for Ontario's generator.

We believe that our plan removes from the equation three huge obstacles to success in the past:

- **OPG and its predecessor were too often used as a vehicle for carrying out public policy goals.** We believe that public policy goals are best carried out by government, and our recommendations address this.
- **OPG and its predecessor have been subject to political interference by governments of the day.** We believe that the best way to govern and run a utility is to select people with the right skills and experience, give them the authority they need, make them accountable, and ensure the right controls – internal and external – are in place and working. Our recommendations address how to do this.
- **Most important, OPG senior management was not held accountable for decisions and performance.** OPG needs greater transparency, clarity in its mandate and accountability for results.

Our picture of what success will look like is:

- public assets are operated and maintained to get the best use from them over the long term;
- private equity, not Ontario taxpayers' money, bears the risk in most major new projects;
- OPG supply to the grid is reliable and cost-competitive;
- the people of OPG work in a positive, constructive environment, see that they are valued, and are accountable for their performance;



- as a rate-regulated company, OPG's focus is on providing supply from core assets into a healthy electricity sector as one of many participants;
- effective regulation ensures electricity ratepayers are not at risk for the missteps of OPG in future; and
- OPG performance is measured by benchmarking against comparable utilities.

All of these goals are measurable, some quite precisely. Measurement and benchmarking can provide the basis for tracking OPG's progress in future. It is an objective way of telling whether the plan is working.

Consultations and information gathering

The OPG Review Committee began its work on December 16, 2003. During our deliberations, we heard from a wide variety of individuals and organizations, through four main channels:

- direct presentations to the committee from electricity generators, distributors and transmitters, electricity industry consultants, labour organizations, members of the financial community, regulatory authorities, government organizations, and environmental groups;
- a roundtable meeting with energy sector associations, environmental groups, major industrial consumers and small business consumers;
- submissions from major industrial associations who were invited to contribute; and
- the thoughts of interested citizens provided through a website established by the committee.

To get an in-depth picture of the organization and technical information about operations, we met with senior OPG officials from all areas of the organization. We also met with representatives of OPG's two labour organizations and with other employees past and present.

We thank everyone who took the time to provide us with their views. A list of those who met with us or sent a submission appears in Appendix B. Copies of submissions received electronically are available on the website at www.opgreview.org.

As well as drawing on the information provided by the individuals and organizations, the committee worked closely with the following expert advisers:

- on financial matters, CIBC World Markets Inc. and PJBTO Associates Ltd.;
- on corporate governance and corporate law, McCarthy Tétrault LLP; and
- on project oversight in relation to the Pickering project, Schiff Hardin LLP, working with J. Wilson and Associates, and Meyer Construction Consulting Inc.

For communications advice and help in drafting the report, we drew on the skills of The Strategic Counsel and Coutts & King Inc. Senior officials in the Ontario Public Service helped us by carrying out research and offering advice, and other Ontario government staff provided logistical support. Appendix C lists research sources.

We also had access to drafts of a report prepared by the accounting firm KPMG LLP that was being prepared in parallel with our review. The analysis KPMG carried out was very helpful to us. It was particularly valuable in highlighting the significant problems in forecasting costs – not just for the Pickering project but also for annual operations and maintenance – in the nuclear division of OPG.

In Chapter I of this report we set out broader issues in the electricity sector, and our observations on these. Subsequent chapters outline our detailed thinking and recommendations in each of the specific areas of our mandate as they apply to OPG.

We believe that our recommendations will put OPG on a realistic and achievable path to better results, and strengthen Ontario's electricity sector as a whole. In Chapter VI we set out crucial first steps in moving towards success. Our recommendations appear where relevant throughout the chapters on role, structure, governance and the Pickering project. As well, a list of all recommendations is included after the appendices.



A final note

In working towards a solution to the problems of OPG, the goal guiding us has been to help government make the most effective choices possible to ensure that OPG contributes as it should to a healthy and reliable electricity sector in Ontario. An equally important goal has been creating the conditions in which the people of OPG can contribute as fully as they are able to the company's success. These goals are not in conflict – in fact, we believe that the first relies on the second.

I. Setting the course

In carrying out our work, we looked first at a number of vital issues that must underlie any thinking about OPG and its future. One is the potential supply shortage identified by the Electricity Conservation and Supply Task Force, referred to here as the Task Force, and the means available to bridge it. The other is the policy environment, which has been prone to abrupt and unpredictable change.

In this chapter, we discuss these areas and set out our views on what is needed to ensure the soundness of OPG and the sector as a whole.

The supply shortage

Remarkably, given the province's history as a leader in electricity production, Ontario is now facing a supply problem that could become serious as early as 2007 and worsen over the longer term.

There are several major reasons why supply is not keeping pace with demand:

- Based on recent information from the Independent Electricity Market Operator (IMO), new capacity currently planned or under construction is well short of what Ontario will need in the foreseeable future.
- Ontario's nuclear fleet is not operating at full capacity, with several units at the Pickering and Bruce plants still out of service from a 1997 shutdown and others at Pickering running well below their potential. Over the longer term, there are serious concerns about the longevity of the entire nuclear fleet.
- Many generating assets are reaching the end of their current useful life or, in the case of coal-fired plants, are slated to close.
- For more than a decade, there has been no effective long-term supply planning. In particular, because market forces were supposed to attract new supply after market opening in 2002, Ontario lost years of valuable planning and construction time from the late 1990s onward.

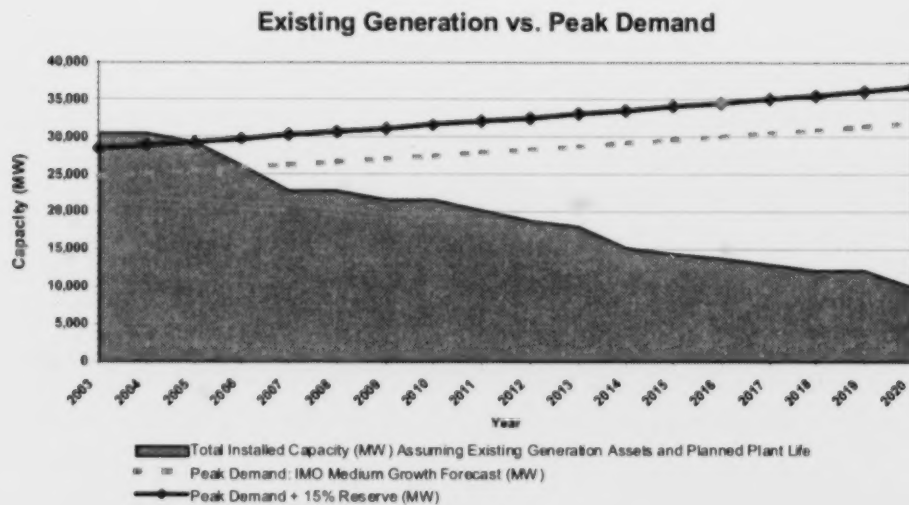
- Demand continues to rise, as the population grows and the economy expands. For example, greater use of air-conditioning in recent years has made summer a high-demand season, as winter has always been.

The conclusions of the Task Force reinforce just how little time is left before demand consistently outruns supply.

In March 2003, a 10-year outlook prepared by the IMO indicated that the province should have adequate supply up until 2007, even in high-growth demand scenarios (although planned reserves would be lower than desired in some cases). But the Task Force updated the outlook to reflect several important factors that would cut into available supply:

- many planned projects in the IMO outlook that would have added 8,700 MW of capacity had been put on hold;
- closing all other coal-fired plants, in addition to the 1,140-MW Lakeview plant included in the IMO forecast, would remove a further 6,420 MW of generation capacity by 2007; and
- the most optimistic of the IMO scenarios had included the three remaining units of the Pickering A nuclear plant, with total capacity of roughly 1,500 MW. Uncertainty about whether and when they would be returned to service had grown in the meantime.

The Task Force's report indicates that under those circumstances, a serious supply gap would start to open by 2007 and would steadily widen.



Meeting Ontario's needs

We agree with the view of the Task Force that a stable and consistent electricity policy framework is essential to increasing supply. This has not been the case.

Major shifts in policy over the past decade and efforts to change first Ontario Hydro and then OPG have resulted in huge staff reductions at Ontario Hydro, a confused role for the company, a loss of focus on supply needs, and considerable uncertainty for the sector as a whole. This timeline shows some of the major events that have had an impact on Ontario Hydro and later OPG and others in the market:

- | | |
|------|--|
| 1993 | Having declared Ontario Hydro "a corporation in crisis," CEO Maurice Strong announces significant staff cuts; rate freeze begins; massive corporate restructuring begins |
| 1994 | Further staff cuts |
| 1996 | Report to new government from Macdonald Commission recommends competition in generation, break-up of Ontario Hydro |
| 1997 | New nuclear team arrives, 4 nuclear units taken out of service; White Paper recommends break-up of Ontario Hydro |
| 1998 | <i>Energy Competition Act</i> introduced; a further 3 nuclear units removed from service; Ontario Hydro starts process to break up into 5 separate entities |
| 1999 | OPG created from Ontario Hydro break-up, decontrol of assets/MPMA begins |
| 2000 | Fossil decontrol stopped |
| 2001 | Fossil decontrol restarted; Lakeview directed to close by April/05. Bruce nuclear plant leased to private-sector operator. |
| 2002 | Market opens, prices soar; government caps price for many consumers. Pickering A nuclear unit restart clearly in trouble. Fossil decontrol stopped. MPMA rebates accelerated. |
| 2003 | Report of panel into Pickering A problems, resignation of board and senior management. New government moves to raise electricity price; names interim OPG leadership; says coal plants will be replaced. |

The changes accelerated with legislation in 1998 that redesigned the market in preparation for full competition in electricity generation and marketing. But the market that opened on May 1, 2002 failed to achieve key goals and quickly led to more changes.

What went wrong? The reasons were complex and are outlined in more detail in the report of the Task Force. Essentially, though, the market didn't work as expected. Too many consumers were exposed to prices that were high and volatile at a time of supply shortage.

Consumers expressed shock. Between media focus on the price spikes that hit on the hottest days, heavy use of air-conditioning and new charges on utility statements that reflected the impact of market restructuring, electricity bills suddenly seemed too high, their components too confusing and pricing too uncertain. Consumer rebates built into the market structure to help deal with some of the changes would not arrive until the next spring – well after consumers had received their new bills.

In response, the government of the day stepped in. Late in 2002, the price of electricity for certain classes of consumer, who together use about 50% of supply, was set at 4.3 cents per kilowatt hour (KWh). Other consumers (mainly large-volume ones who hadn't arranged contracts) still dealt through the spot market. The delivery of rebates was accelerated.

But one feature that was not changed was the rebate mechanism. Most of the funds for the consumer rebate came from OPG's revenues, through the Market Power Mitigation Agreement (MPMA). This was tied to a plan to have OPG give up control of most of its assets over a 10-year period. Although the decontrol process was stopped in 2002, the payments under the MPMA were not. To January 31, 2004, OPG had made a total of \$2.65 billion in payments for consumer rebates under the MPMA.

At present, the government has committed to creating greater certainty and stability in electricity policy and to pricing that better reflects the cost of producing electricity. As a starting point, it has:

- moved to introduce an interim pricing system effective April 1 of this year that will tie the price consumers pay per kilowatt to the amount used, benefiting low-volume consumers and encouraging conservation; and

- directed the Ontario Energy Board (OEB), the regulator, to develop a new pricing mechanism to be put in place by May 1, 2005.

While we were not asked to recommend a specific market design, we provide the following as our views as to the outcomes any design should promote. A key element needed to achieve all of these outcomes is pricing, which must reflect the full cost of electricity.

Ontario should aim to be self-sufficient in electricity, including an appropriate reserve margin, over the long term

- We are reaching the limits of the import transmission system. Building new transmission lines can take longer than building new capacity.
- On the days we run short of power because of severe weather, the nearby jurisdictions from which we can most easily import power are likely to face high demand as well. That makes us dependent on their supply strategy.
- The price of power available for import increases significantly when supply is tight. This could make Ontario a less competitive place to run a business.
- Import dependency that puts supply at risk can have serious economic impacts if businesses have to curtail usage or shut down.
- There are strong environmental reasons for keeping supply in Ontario, where government policy can set higher environmental standards. For Ontario, nearby states that depend heavily on coal plants are a major source of imported power. These plants typically operate at lower air-quality standards than the new standards planned for Ontario, yet their emissions drift into our air shed.

Electricity costs must be competitive

A mix of generating sources and new investment will help to ensure that Ontario's electricity prices remain competitive, which is key to economic success. As the report of the Task Force pointed out, the energy efficiency of Ontario's economy has increased, particularly as the province shifts to a greater share of service and knowledge-based businesses. However, Ontario's future as an attractive place to invest and create jobs depends on electricity prices remaining competitive against other jurisdictions that want to attract the same businesses.

There should be a diversity of fuel sources

Diversity of supply enhances reliability and security of supply. It also allows the most efficient mix to meet fluctuating power needs.

We believe a supply strategy for Ontario should include:

- growth in "green," renewable power and other solutions that use innovative technologies;
- best possible use of existing hydro-electric assets, and adding new hydro capacity where it makes economic and environmental sense;
- building of natural gas-fired plants where needed across the province; and
- sufficient nuclear generating capacity, provided cost-effectively.

There should be new private investment in electricity generation

New investment is key because:

- Ontario needs more supply and needs it quickly. New investors are well positioned to add new supply in the short time available.
- Diversity is important, as noted above. New investors are well-suited to increase supply diversity with sophisticated new technologies and approaches.
- Investing in new electricity generation involves business risks. We believe private investors are generally better able to allocate capital and better positioned to assess, manage and bear those risks.

Ontario should promote conservation

Conservation represents the cleanest means of filling Ontario's supply gap. A recently released report from the OEB recommends ways of promoting conservation and removing unintentional barriers to it.

As the OEB noted, price signals are crucial to conservation. If consumers don't pay the full cost of electricity, they are less likely to make the investments needed to conserve it.

We understand the government is committed to conservation as an approach to deal with the supply shortage. In fact, in its recently announced plans to issue a request for proposals for the supply of power, the government has indicated it will consider demand side management proposals.

Regulation should be effective

Our recommendations include an expanded role for the OEB as the regulator of OPG. We believe that whatever the final shape of the sector, regulation must be transparent, effective and certain. The OEB must be a strong, independent and effective regulator.

Other supply issues

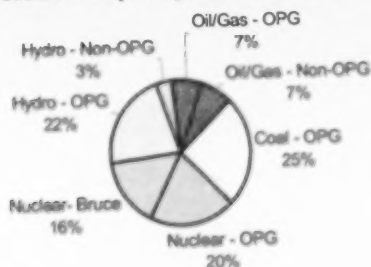
There are two additional factors relating to supply that merit discussion. The first, which relates to the near-term supply question, is the policy direction on coal. The second is the long-term importance of nuclear generation in Ontario's electricity supply mix.

i. Coal

Coal is a major source of electricity generation in North America. It is the single largest source of supply in the United States, and is especially important in states close to Ontario. North America has very large reserves of coal: enough, it is projected, to last more than a century. U.S. reliance on coal is expected to grow, with an estimated 94 plants planned across 36 states.

At present, OPG operates five coal-fired plants that provide more than 20% of Ontario's electricity supply. On a typical day over the past winter, they generated about 5,500 MW of power from a total available capacity of 7,500 MW.

Generation Capacity Mix in Ontario - 2003



Note: Other Non-OPG generation sources (not shown) are sources such as wind and biomass. These account for less than 0.3%.

The government has set the objective of replacing the province's coal-fired plants by the end of 2007 for health and environmental reasons. The majority of market experts have said that meeting the 2007 target date will present challenges and will result in significant increases in the cost of electricity. In the new sectoral framework, planners, OPG and other suppliers will need to work towards an orderly transition that manages the supply and price concerns.

The IMO reported that for the period from May 2002 to November 2003, coal was the price-setting fuel in Ontario 56% of the time, at an average price of 3.38 cents/KWh. Gas/oil, an alternative to coal generation, set the price of electricity 30% of the time at an average price of 7.88 cents/KWh.

Although our focus in this review has been on OPG as a business, with a larger view to the pivotal role the electricity sector plays in Ontario's economy, we believe that improved air quality is an important and valid goal. While there will be costs associated with action on coal, there are also serious costs to inaction. These may be difficult to quantify, but they manifest themselves in increased costs to our health care system and to the economy through lost work days and productivity declines. Clearly, these costs must also be taken into account.

We understand that there are other approaches that could reduce current emission levels substantially through closing or converting to gas most of the plants, and installing new

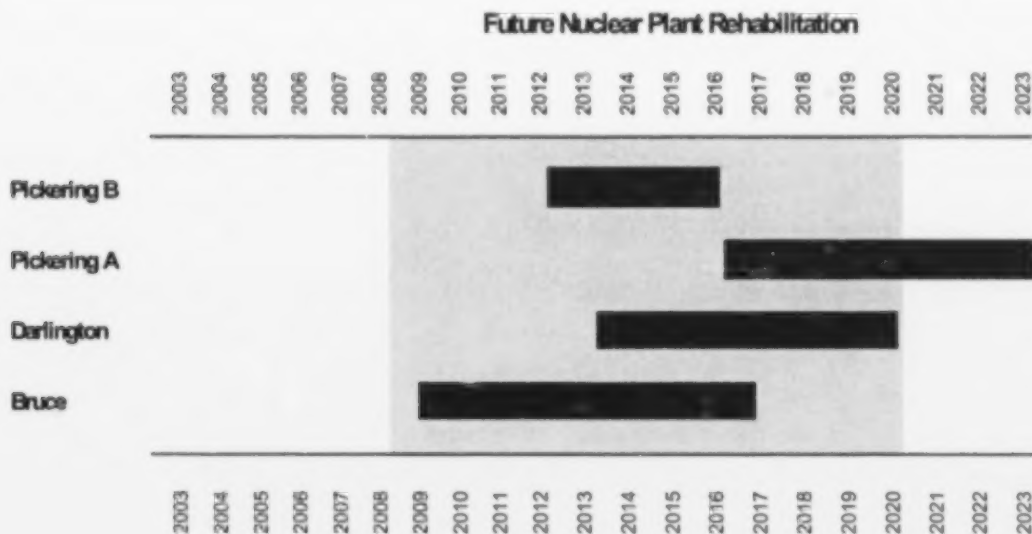
technology to reduce the emissions of any remaining coal generation. These, too, are factors for the government to consider as it moves towards its objective.

ii. Nuclear

Nuclear plants are well suited to provide base load power needs. A base load power plant is most efficient when it can run continuously with relatively low operating costs. This brings stability to the cost of producing the foundation of electricity supply.

At present, nuclear plants provide most of Ontario's base load power needs. Apart from major hydro-electric facilities, Ontario has few other options for base load power.

However, plants operating today will need major investments starting in 2009 that would take up to 15 years to keep them running safely and efficiently. Depending on the condition of units and the business case, the industry can handle up to three concurrent unit rehabilitations. These requirements give rise to the possible schedule as shown in this chart:



Based on our review of the experience with nuclear power in North America and worldwide, we have concluded that Ontario must begin planning now to supplement and

ultimately replace its ageing nuclear assets with new and better generations of nuclear technology.

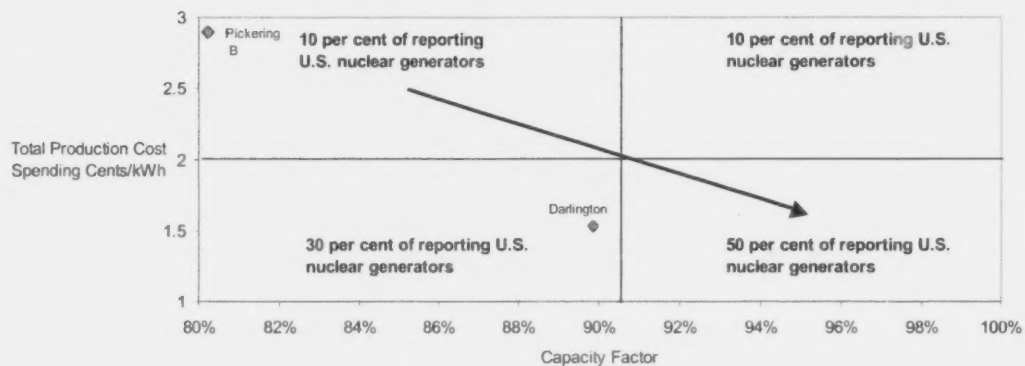
There are several reasons for this need:

- As noted, nuclear plants can be a cost-effective source of base load generation. Initial construction costs are high, but the operating costs of a properly maintained and run plant are relatively low and steady. This means the price of power they generate is stable over time.
- Ontario has few opportunities left to build major new hydro-electric projects that fit the profile for providing base load.
- Coal and gas are both used elsewhere for base load. However, Ontario is decreasing its dependence on coal. Gas prices are now high and volatile, and expected to stay that way for the foreseeable future. Relying heavily on gas to provide base load would push up the level of Ontario's electricity prices and make them unstable.
- Renewable energy sources, conservation and co-generation are all important, but cannot fully bridge the supply gap.
- Ontario's existing nuclear plants are based largely on technology developed in the 1950s and 1960s and tested for the first time in Ontario. While it is possible to extend the life of these plants, the next generation could benefit from new and emerging technologies.
- Nuclear power does not contribute to air emissions the way coal and gas do, and does not involve the complex watershed management issues of hydro projects. While safe long-term disposal of spent fuel is vital, there is a cooperative process under way between the federal and provincial governments to ensure this will be done.

In our deliberations, we looked closely at the Canadian and international nuclear industries. We met with regulators, industry consultants and plant operators.

Nuclear power now meets more than 20% of U.S. and European electricity needs. The nuclear industry in a number of countries, including the U.S., operates cost-effectively, safely and at high standards.

Capacity Factor and Total Production Costs



Note: Capacity factor is the percentage of time the plant is up and running.

But we also learned that success in this highly complex industry is far from given. We believe Ontario can and must learn from the experience and approaches of other jurisdictions. We offer the following observations on issues critical to Ontario's nuclear future:

- A nuclear strategy should be driven by what is best for Ontario's electricity sector only. A broader industrial development strategy for the domestic nuclear industry should not enter into decisions.
- Ontario should not be biased towards choosing Canadian-developed technology, but should seek out the best available technology worldwide.
- The new electricity sector framework will have to include a planning function. Planners should use a rigorous competitive process for nuclear projects that puts all potential suppliers, whether based in Canada or elsewhere, on the same footing. Ontario should be able to draw on the best expertise in the world to build, operate and maintain them.

- The construction and operation of nuclear plants involve substantial financial risks, including cost overruns. In the past, ratepayers have borne the impact. In future, the financial risks that arise from cost overruns must be managed so that both ratepayers and taxpayers are substantially protected.

Given the long lead time required to construct a nuclear plant, planning should start now, but should not take the focus off short and medium-term challenges, such as improving the performance of OPG's existing nuclear assets.

In sum, we believe that the right nuclear strategy will play a key role in ensuring that Ontario has reliable, competitively priced power over the long term.



II. Role of OPG

In the Introduction, we envisioned OPG's role to be that of a steward of Ontario's publicly owned generating assets. We believe it is essential to provide clarity that OPG's responsibility is to be a business that operates on commercial principles as a producer of electricity. Public policy or political objectives should be achieved through other means.

In this chapter we explain the basis for this recommendation and provide more detail about the role.

An unfocused past

The roles of OPG and its predecessors have shifted between commercial entity and public policy instrument.

Since the establishment of Ontario's government-owned electricity utility in 1906 – the first in the world – its role has often involved acting as an instrument of policy. There is strong evidence, for example, that the utility's choices around nuclear generation, including reliance on CANDU reactors and rapid expansion in the early 1970s, reflected both a desire to promote home-grown technology and provincial industrial policy.

Efforts in the early 1990s, in contrast, had focused on orienting Ontario Hydro towards "sustainable development," reflected in a restructuring of the utility and even a proposal to offset carbon-dioxide emissions by purchasing areas of tropical rain forest.

Most recently, deregulation of the Ontario market was supposed to allow OPG to enter the North American market as a major competitive player. In fact, it was actively pursuing power plant acquisitions outside Ontario.

At the same time, the decontrol of most of OPG's assets, as explained in Chapter I, was an underlying principle of the new market design. The goal was to reduce OPG's share of capacity to 35% of the market by the end of ten years. Before the process was stopped in 2002, OPG had decontrolled roughly 6,700 MW of operating or laid-up capacity. (OPG's generating capacity is currently about 23,000 MW.)

If OPG is to function as an efficient company, and become a part of the solution to Ontario's supply needs, its role must be focused and free of interference.

OPG as a publicly owned steward

OPG owns a set of core generating facilities built with the money of taxpayers and ratepayers that have been in public hands, some for close to a century. They deliver a service critical to the welfare of the province.

We believe that the appropriate stewardship role for OPG is to operate these core assets as efficiently as possible. This is key to ensuring that the province has a diverse and stable supply of electricity at a price that is competitive with other jurisdictions. We believe this can be done while OPG remains in public hands.

For OPG to be an effective steward, we believe that:

1. OPG should be rate-regulated on an effective, transparent and independent basis.

Before market restructuring, Ontario Hydro and later OPG either set its own rates based on direction from the Province, or had them set by the Province – in either case, a highly political process. The Ontario Energy Board had a review role only.

Our recommendation means that the Ontario Energy Board would regulate OPG by division, based on full access to OPG cost information that is assigned properly to each division. The rate would be based on the cost of production and a reasonable rate of return on capital. Regulation would be performance-based: that is, designed to drive better efficiency within each division and protect the interests of ratepayers.

There are several benefits to this approach:

- It increases the transparency of OPG's overall operations and specifically allows a much clearer view of the relative performance of the generating divisions. This is key, because the nuclear division has had a poor track record in controlling costs.
- Greater transparency will drive greater accountability. Results by division will be made public and benchmarked against similar businesses.
- A rate-regulated OPG will provide stability in electricity pricing for a large percentage of the generating output in the province.

- Finally, regulation will help to ensure that the impact of OPG inefficiencies is borne by the shareholder, not the ratepayer. This provides a strong impetus for the shareholder to allow OPG to run as efficiently as possible.

We are aware that when setting up a new policy framework for the electricity sector, the Province may put in place an electricity sector model similar to the one recommended by the Task Force. In that model, the output of OPG's existing "heritage generating assets" would be largely regulated, while other suppliers would operate in an open market. Regulating OPG avoids the potential risk of its dominating the market, but balancing this with other needs of the sector will call for a flexible approach. For example, to function efficiently, the market portion of the sector may need output from OPG to ensure liquidity. This needs to be done in a way that does not allow its supply dominance to influence prices.

2. OPG should actively pursue the best available means to operate its assets efficiently. OPG should be encouraged to enter contractual arrangements on a case-by-case basis, following rigorous business analysis, to ensure the assets are put to their most productive use. For example, this could include joint ventures, partnerships, and long-term leases with other parties.

3. OPG should focus on its major operating assets: nuclear, major hydro-electric facilities, and its fossil fuel facilities. OPG currently has business units and activities that do not relate to these major operating assets. It should exit these businesses.

During our consultations, we heard that small entrepreneurial companies are in a much better position to provide renewable energy and other specialized solutions such as wind power, solar power, biomass energy and small hydro projects.

Less than one per cent of OPG's current generating capacity comes from these sources. A company the size of OPG will not give the appropriate level of attention to a business that accounts for such a small part of its output.

We believe strongly, however, that those assets must continue to serve electricity consumers and that new ones must be built and run by those who can do it as efficiently as possible.

4. OPG's role as a builder of new capacity should not be exercised in a way that is a disincentive to new investors. Financing the long-term commitments involved in providing major new generating assets involves risk. We believe that project proponents

should bear that risk to the greatest extent possible. A competent authority, at arm's length from government, should determine the future supply needs of the province and determine if and when OPG's role as builder is required.

5. OPG should focus on Ontario's needs, not OPG growth in the North American market. Ontario has a strong identified need for more supply. To be an effective part of the solution, OPG needs to focus on Ontario.

Recommendations

Recommendation II.1

That OPG serve the people of Ontario as a steward of its core generating assets providing a diverse, cost competitive, stable supply of electricity at regulated prices.

Recommendation II.2

That the government of Ontario remain the sole shareholder of OPG.

Recommendation II.3

That OPG retain ownership of its nuclear, major hydro-electric, and fossil-fuel generating assets.

Recommendation II.4

That OPG withdraw from non-core businesses (including wind-power, solar, biomass and small hydro projects) in an orderly fashion to allow room for others better suited to these businesses.

Recommendation II.5

That OPG may, on its own or with partners, redevelop, enhance and/or expand existing facilities that are part of its core assets.

Recommendation II.6

That OPG be able to develop new facilities only when called upon to do so by the mechanism created to oversee supply planning for the electricity sector .

Recommendation II.7

That the Ontario Energy Board, acting as an independent body, approve the rate or rates at which the output of each OPG generating division is sold.

Recommendation II.8

That, for each generating division, the Ontario Energy Board base the rate or rates on cost of production plus a reasonable rate of return on capital that is comparable to the return earned by a regulated commercial company (or division of a company) with a similar business profile.

Recommendation II.9

That the Ontario Energy Board apply performance-based rate-making approaches to setting OPG's rates to drive better performance at OPG.

Recommendation II.10

That OPG explore joint ventures, partnerships and leases for the operation and maintenance of its core generating assets where it is in its commercial interests to do so.

Recommendation II.11

That, where appropriate, OPG make its land holdings available on commercial terms to other parties to develop new electricity generating facilities.

III. Structure of OPG

Given our view of the appropriate role for OPG, our next question was, what is the corporate structure that will allow it to make the most of its assets?

Under the existing structure of one company with many divisions, it is very hard to determine where corporate resources go and what is achieved with them. This is a significant issue. The problems returning Pickering A to service and in the nuclear division as a whole have absorbed huge cash flows, as well as management time and effort, over the years.

As a result, we felt that the cornerstone of a structure for OPG would be a clear separation of the nuclear generating business from hydro-electric and fossil fuel generating business. This separation would:

- make it very clear how each one performs;
- eliminate the risk of cross-subsidization between business lines, which can distort performance measurement;
- improve accountability, which will be key in turning around the performance of the generating assets;
- give workers the chance to show how well their particular business can perform; and
- let each senior management team focus more sharply on the performance of a smaller, more homogenous organization.

With those goals in mind, we identified three main approaches to OPG's structure:

- create separate stand-alone operating divisions within OPG, with greater accountability than at present;

- create two operating subsidiaries under OPG, which would then be a holding company with overall corporate responsibility for the results of its subsidiaries; and
- divide OPG into two separate companies, each one directly owned by the Province.

We reviewed each of the models. This table summarizes what we saw as the benefits and drawbacks of each approach:

In narrowing down the options, we looked first to the likely business outcomes of each:

	Benefits	Drawbacks
One company with divisions	Company can focus fully on improved results, including Pickering One board, management team overseeing all generating assets Greater certainty for company and market	Requires careful design to ensure accountability, avoid cross-subsidization, and assess how well divisions perform
Holding company	Makes results of each subsidiary easier to assess Separates operational focus from broader strategy issues Lets workers better "own" the results of their business	Restructuring would distract leadership Needs appropriate controls over shared corporate resources "Real" authority would be in operating companies, leaving holding company role uncertain Additional overhead costs
Two companies	Makes results of each company easier to assess Strengthens focus by having fewer lines of business Lets workers better "own" the results of their business	Major upheaval for workers and company Maximum distraction for leadership Increased risk of inappropriate shareholder involvement Shareholder must recruit two boards, two sets of senior executives

How much would it improve performance? What risks would it entail? We then tried to get a sense of whether the net gains of the option would outweigh the costs of creating it.

However, we saw substantial risks in a break up, in that it would:

- Force a huge restructuring onto a company already struggling and a sector in the midst of major change. OPG is finally rebuilding after the break-up of Ontario Hydro, which took almost three years to digest. A second round of de-merger at this point would cause major cultural and logistical upheaval.
- Divert senior management time and attention while the company also needs to:
 - prepare for a new regime for the electricity sector;
 - deal with the Pickering refurbishment; and
 - overhaul elements of the company's governance and accountability structures.
- Keep OPG from showing its true potential. The period from its creation in 1999 has been marked by so many abrupt changes, including market power mitigation conditions, starts and stops on decontrol, and the opening and partial closing of the market, that the company in its current corporate structure has not had the opportunity to operate in a clear policy environment.

We felt that from a business perspective the third option (separate companies) offered little, if any, net benefit over the second and involved much greater drawbacks. For those reasons, we took it off the table.

While we were drawn to the second model, we felt that the costs, in terms of distracting the company, the shareholder and other interested parties, were too great at this time. We believe that with the recommendations we have set out, OPG can gain virtually all of the benefits of the holding-company structure.

We therefore concluded that the first model, in which OPG remains as a single company with separate operating divisions, can best meet OPG's needs.

Our one-company model, however, is not the status quo. The people in divisions need to be able to point with pride to improved performance. Divisions also need to be accountable.

We are recommending a fundamental change in accountabilities. We suggest that each division have a separate management team led by a divisional Chief Executive Officer. These people will be accountable for the results of their division to the CEO of OPG.

We also want the OEB to regulate OPG by generating division, as described in the previous chapter. As well, we recommend that the company put internal systems in place to make divisional results fully transparent.

The divisions should absorb as much as possible of the typical corporate functions that go with operating a large complex business. Minimizing cross-subsidization, which leads to an obscuring of true costs, will enforce a high level of accountability.

To further strengthen accountability, we suggest that the board have competencies or committees to oversee and challenge the business and affairs of each division. This also will permit a small core group of directors to develop a better understanding of the business of that particular division and to bring that understanding to the full board.

We are aware that transparency will be a key to success in the one-company model. The detailed costing and operational information required by the OEB to justify rates will help.

In addition, each division should be required to prepare a budget and business plan against which performance can be measured. Publishing financial statements for each division, with discussion of results against plans, will allow follow-up.

We also concluded that OPG should remain a reporting issuer under securities laws. This status requires it to disclose in a timely manner financial, operational and strategic information to securities regulators and the public.

So that OPG can be measured accurately on its performance against other commercial utilities and to recognize the full cost of producing power, OPG needs to have a financial structure similar to other similarly regulated utilities and earn a regulated rate of return on its capital. These are covered in our recommendations in this chapter.

We see no benefit in changing OPG from its current status as a business corporation under the *Business Corporations Act* (Ontario), which provides a well defined code for business activity. The alternative would be to make OPG an agent of the Crown. OPG needs to stand on its own, not as a Crown agent, and be operated as a commercial enterprise. In line with that belief, the current arrangement – in which the Province does not guarantee OPG's debt – should continue.

Recommendations

Recommendation III.1

That OPG remain a single, commercially oriented company under the Business Corporations Act (Ontario); that the current arrangement in which the Province does not guarantee OPG's debt continue; and that OPG be divided internally into two principal operating divisions, the nuclear division and the hydro/fossil division.

Recommendation III.2

That a separate management team led by a divisional Chief Executive Officer, accountable to the CEO of OPG, operate each division.

Recommendation III.3

That OPG be structured so that as many as possible of the operating functions necessary for the success of a division, including regulatory affairs, financial reporting and risk management, are located within the division, and that each division assume or absorb all corporate costs and head office costs reasonably associated with its share of the business revenues of OPG.

Recommendation III.4

That the divisions each year produce detailed financial statements, and a management discussion and analysis of results, which are made public.

Recommendation III.5

That each of the divisions produce each year an annual five-year rolling business plan for the division, which will form the basis of the OPG business plan.

Recommendation III.6

That OPG as regulated company have a capital structure similar to other regulated commercial utilities.

Recommendation III.7

That as soon as practical the OPG Board present a plan, with timeframes, to the shareholder for reorganizing the company into two principal operating divisions and winding down non-core business units.

IV. Governance

The motivation to build an organization committed to excellence must begin at the top of a company. The Chair and Chief Executive Officer, working with the board, must spread this culture by example throughout management and the entire workforce. What is done at the top is critical, because culture and values in an organization – the foundations of good governance – are spread and learned by example. In the case of OPG, we believe workers want to have pride in their company, but they must feel they are part of a team that shares a common goal of excellence: running a first-order utility.

Achieving this will lead to a profound cultural change. It will, over time, break down the silo mentality of departments and the tendency to avoid taking responsibility that has marked the attitude of too many senior managers of OPG in recent years.

The starting point is that the government must mandate the leadership of OPG to build a competent, commercially-oriented company, free of political interference and subject to clear public oversight. From that will flow the stronger governance, greater accountability and more positive culture that OPG needs.

What good governance means

The Organisation for Economic Cooperation and Development (OECD) has defined corporate governance as “the system by which business corporations are directed and controlled.”

Good governance depends on people as well as rules and structures. In discussing control, which is a component of governance, the Canadian Institute of Chartered Accountants notes that: “. . . control is as much a function of people’s ethical values and beliefs as it is of standards and compliance mechanisms.” We believe this to be true not just of control systems, but of governance as a whole.

Governance is very much tailor-made for every business and organization. A good governance plan puts in place the people, systems and controls that will enable the business to deliver on its unique mission, vision and objectives. The governance needs of an organization will also change over time. They need to be regularly reviewed.

Effective governance will:

- allocate responsibilities to parties such as the board of directors and the managers of the organization in such a way as to make them accountable in clear terms;
- provide the means for setting and pursuing company goals in a transparent and open way; and
- create the structures to manage risks and monitor performance.

Poor governance presents huge risks including potential loss, misdirection or misuse of assets, missed opportunities, and the creation of a culture in which people can't do their jobs properly.

In the case of OPG, the starting point for a solid governance plan is a government prepared to clearly address and strengthen some of the governance considerations we identify in this chapter that involve the shareholder. The starting point is also the creation of a stable independent operating environment for OPG.

Accountability depends on a strong and well resourced OPG, a clear mission, vision and strategy and an incented work force. The long-term objective must be to mandate a board to build an efficient, proud utility operating in a transparent environment with the necessary independence from government to enable it to be held accountable for its actions.

Our review of a number of OPG's governance controls and systems indicated that significant time and effort was spent on governance. Many of the systems we saw were of very high quality. Our governance concerns are more directed at how OPG relates to its shareholder, the effectiveness of the board and issues around culture within the organization including how people are held accountable. We have therefore approached our additional governance recommendations contained in this chapter by looking at four sub-areas:

- Shareholder, board and management roles, accountability and transparency
- Setting and pursuing company goals
- Structures to manage risks and monitor performance
- Corporate culture.

Our recommendations are aimed at improving accountability, creating greater transparency, strengthening the role of the OPG Board and strengthening governance systems around expenditure approvals. Many of our most important recommendations on accountability and transparency are previously discussed in chapter III which deals with the Structure of OPG.

Shareholder, board and management roles, accountability and transparency

In the commercial world:

- The owners appoint a board of directors with broad skills and experience to oversee the running of its business.
- The board assumes responsibility for oversight of the business – especially for delivering results – and is accountable to the owners for its successes and failures.
- Professional managers hired by the board take care of the day-to-day running of the company, within the strategy and policy framework set by the board, and are accountable to the board for results.

Although a minister typically represents the government in the role of shareholder in a Crown corporation, the ultimate beneficiaries of the efficient operation of OPG's assets are really the people of Ontario. Transparency is therefore very important. The people of Ontario reasonably expect to know what is going on at OPG.

There are special challenges where the sole shareholder is the government. Because the government sets electricity policy, the company must be operated transparently and have the independence it needs to ensure that OPG is no more subject to public policy direction than any other generator in Ontario. Special measures need to be in place.

We believe the best way to ensure that OPG is governed well is to start with ensuring its relationship to the government is purely a commercial one. We believe a strong, independent OPG Board is critical to achieving a commercial relationship. The Board needs the right skills, resources and powers to oversee what is a complex business. To be effective, however, the board should consist of no more than 12 people.

As sole shareholder the government should continue to have the power to appoint all directors. However, the board should have input into this process and our recommendations reflect this. We have suggested other ways of strengthening the board while at the same time making it more accountable.

Governance requires that the organization itself be held accountable. We have discussed in Chapter III how to improve accountability at the operational level through structural change. Benchmarking is also important. Using the benchmarking systems widely available through industry groups such as the Institute of Nuclear Power Operations and the World Association of Nuclear Operators is already a priority for OPG. Benchmarking for the nuclear and non-nuclear businesses should be considered to be near the top of the list in assuring accountability. OPG should annually and publicly report on how its performance has been benchmarked.

The people in any organization, if it is to be well-run, must be personally accountable. This is a key part of a strong governance culture. Personal accountability should grow out of a determination not to let the other team members down not out of a fear of punishment.

Accountability and compensation are closely linked. Providing the right incentives can help keep people accountable. We believe that a substantial portion of compensation for senior management at OPG should be performance based and should very much be tied to those things for which individual senior managers are held accountable.

The Pickering A Review Panel cited work by external consultants that pointed to a serious lack of accountability throughout OPG. Many people do not appear willing to take responsibility for their poor performance.

On the other hand, some observers have noted that the company appears to have failed at times in its responsibility to give staff the training and systems needed to prevent mistakes. This may understandably have led to a culture in which avoiding blame is more important than admitting errors.

As accountability starts at the top, the board must be able to hold senior executives accountable in terms of running the business on a commercially efficient basis. This means settling with senior executives on an annual basis the priorities and objectives for them as understood by the board.

The following recommendations relate to shareholder, board and management roles, accountabilities and transparency, and the effectiveness of the board. We recognize that some transition may be necessary in relation to our recommendations, for example recommendation IV.2.

Recommendation IV.1

That the OPG board consist of up to 12 directors appointed by the Province and that the directors bring to the board skills and experience in areas such as nuclear electricity generation, finance, environmental matters and human resource management.

Recommendation IV.2

That the Chair serve part-time and have no executive powers.

Recommendation IV.3

That Board members be remunerated in line with remuneration paid to members of boards of comparable private sector entities.

Recommendation IV.4

That when new directors are needed, a committee of the board of OPG develop, for shareholder consideration, a list of board needs and skills that is made public and is used by the committee to develop a roster of director nominees for shareholder consideration.

Recommendation IV.5

That instructions or similar directives, when given by the shareholder to OPG, be in writing and be given as a matter of public record.

Recommendation IV.6

That OPG each year certify and disclose senior officer employment terms, compensation, benefits and expenses.

Recommendation IV.7

That the Board issue a report each year on its priorities and progress and its conclusions as to how effectively the company was governed during the prior year.

Setting, pursuing and achieving company goals

A well-run company knows where it is going and why. It is also set up to pursue its goals effectively.

OPG has been assigned a wide range of goals in the recent past, some of them conflicting. In addition to that problem, we found other problems at OPG in the area of setting and pursuing goals:

- Employees do not have a sense of what the company's overall mission and vision are.
- Constant change at the senior management level has disrupted continuity and resulted in employees looking at senior managers as short term players.
- The problems at Pickering came to overwhelm other goals in the recent past.
- There is not a strong enough link between achievement and rewards.
- Many staff members that OPG considers to be managerial belong to a bargaining unit, which may be an obstacle to accountability and effective pursuit of company goals.

OPG currently has a vision – “to be a premier North American energy company” – that is so broad as to be almost meaningless. Given its many roles and the changes in the market, this is understandable.

What OPG needs, going forward, is a mission and vision that reflect a more focused role in a more stable environment. Mission and vision, at a high level, set out the big picture of where the company wants to go and how. The vision should focus on what future success will look like. All of this helps to align the company's resources and business planning.

To act on its mission and vision, a company needs a strategic plan. This typically covers a specific period into the future, as opposed to the ideal end-state of the vision. A business plan – explaining in more detail how corporate resources will be used to pursue the strategy – follows from the strategic plan.

Currently, OPG undertakes an annual planning exercise that results in a business plan approved by the Minister of Energy. It is not clear how actively the shareholder takes part in the planning exercise. To create independence for OPG as well as accountability for results, we believe OPG should use a five-year rolling strategic business planning system. Each year the plan would be reviewed, renewed and approved by the OPG Board and by the shareholder. The approval should be through a clearly understood approval process. Once approved, OPG has the authority to operate within the plan with the clear support of the shareholder. These arrangements we believe will work in favour of greater independence for OPG, subject to it being clearly accountable for performance.

Managers are the people who turn a company's strategy and plans into results. They can best achieve this by building and mobilizing the skills and knowledge of a workforce that understands the strategy and sees the benefits of success. Being clear about vision and strategy is important to the workforce in an organization like OPG.

The goal of our recommendations in this area is to help managers at OPG – not just senior managers, but the entire team – do their jobs better and contribute to the company's success.

The following recommendations relate to OPG's **strategy and goals**:

Recommendation IV.8

That OPG clearly define a mission and vision for the company, based on its role as steward of core generating assets and also reflecting such elements as:

- *Environmental sustainability;*
- *Due regard to health, safety and community needs;*
- *Relative performance among peers; and*

- *Achieving its goals through a workforce committed to embracing the public trust around Ontario's publicly owned generating assets*

Recommendation IV.9

That every year OPG prepare for Board and shareholder approval a rolling five-year business plan and that a summary of such plan be made public;

That each operating division prepare a similar plan on which the OPG business plan can be based; and

That OPG submit to the shareholder for approval any material capital expenditures not included in the approved OPG business plan

The following recommendations relate to **pursuing and achieving its strategy and goals:**

Recommendation IV.10

That the Board hold management accountable for pursuing and achieving company goals by:

- *establishing annual objectives for the CEO reflecting the company-approved business plan;*
- *ensuring that a significant portion of compensation is performance based;*
- *aligning performance based compensation with such annual objectives; and*
- *requiring the CEO to establish similar arrangements for the divisional Chief Executive Officers and the other senior officers of the divisions.*

Recommendation IV.11

That OPG hire and compensate managers in line with market conditions for comparable utilities.

Recommendation IV.12

That throughout the organization, where possible, compensation be tied to individual, divisional and company performance

Structures to manage risks and monitor performance

Failure to identify and manage risks and to monitor progress effectively was a central feature of the problems in the Pickering A Unit 4 project. Cost controls in the nuclear division are a particular issue.

We have observed or seen evidence of problems in these and other areas within OPG relating to:

- Project scoping and feasibility
- Processes and systems for individual reviews and evaluations
- Labour relations risks

We recognize that the company has made significant progress in many of these areas as they apply to the Pickering project. We discuss those in considerable detail in Chapter V.

We are concerned that many of the problems manifested at the board level – cost overruns, inadequate or confusing information for decision-making – may arise from long-standing problems in the area of controls at the operating level. We feel the evidence of problems is serious enough to warrant investment in finding and correcting them.

Of immediate need is for OPG and its board to look carefully at its processes and procedures around planning major expenditures.

The following recommendations relate to OPG's structures to **manage risks and monitor performance**:

Recommendation IV.13

That OPG develop control systems around major capital expenditure and/or O&M programs including:

- *robust controls and metrics to measure project value as expenditures are made;*

- *conditions for making major capital expenditure decisions around the degree of completeness of project scoping and engineering;*
- *the means by which the board can be assured that all alternatives have been appropriately challenged before go-ahead authorizations are given for major expenditure programs; and*
- *the process by which follow-up reviews will be conducted in an independent manner to establish how actual performance compares to projected performance as estimated at the time of project approval.*

Recommendation IV.14

That OPG examine its approach to information provided to the board with respect to major projects and programs to ensure that the information provided by OPG to its board includes a full assessment of risks associated with the decision and the timing of the decision.

Recommendation IV.15

That a Chief Governance Officer be designated to assist OPG in managing governance related matters.

Corporate culture

Our work on governance was carried out against the backdrop of OPG's corporate culture. The culture of the workplace is critical to whether governance systems can achieve their potential. Workers and managers need to work in an environment of trust and teamwork.

We make these observations because the most pervasive problems at OPG and its predecessor seem to relate to corporate culture.

It would hardly be surprising to see cultural and organizational problems in a company that only got started in 1999 and that has lived through changes as dramatic as those outlined in this and the previous chapters.

While the Committee did not carry out any new detailed work in this area, we did benefit from the views of many OPG stakeholders, including current and past employees and

board members. We also relied on the work of the Pickering A Review Panel, whose report summarized previous studies carried out by impartial observers.

The picture painted for us was one of an organization in which many people work hard to do their jobs well, but face an environment that harms morale and hinders performance. The reasons arise to some extent from external forces, but also seem to reflect long-standing problems dating back to Ontario Hydro days as well as recent failures.

In particular:

- For decades, Ontario Hydro operated as an unregulated monopoly supplier to most of the market, engendering a mixture of arrogance, corporate intransigence and bureaucracy.
- Because of its key role in the economy and direct government ownership, it has operated in a highly politicized environment.
- OPG has not focused strongly enough on developing its leadership from within, as the Review Panel report noted.
- As noted, in recent years the company has been whipsawed by changes, including restructurings and massive layoffs.
- Layoffs have left in place a workforce skewed towards seniority. The average worker age is 45. Out of a permanent workforce of close to 11,000, only 700 employees are under 30. Almost one-third are over 50.
- The Pickering A Unit 4 failure has had a hugely demoralizing impact.

Labour Relations

On a broad corporate level, we believe that the labour relations environment is a significant obstacle to the culture change needed to improve OPG's performance.

We do not intend this as a negative reflection on unions generally or on the union or management leadership at OPG. Experience in Canada and elsewhere shows that large



organizations in the public and private sectors can operate efficiently and with productive union-management relationships. At OPG, it appears that both management and its unions have made progress in recent years towards a better relationship.

Yet, in a recent survey on worker engagement, OPG ranked far below the average of similar-sized unionized organizations. We believe this reflects systemic problems at OPG stemming in part from a long legacy of labour relations challenges at Ontario Hydro.

At present two unions, the Power Workers Union and the Society of Energy Professionals, represent roughly 90% of the OPG workforce. Unionized workers at OPG and Ontario Hydro have always held the right to strike. Other public sector workers in Ontario who provide critical services, such as hospital workers, fire fighters and police officers, are subject to arbitration for resolving disputes.

Because a strike by electricity workers would cause enormous harm to Ontario, management's bargaining power was weakened through successive rounds of bargaining. Over time, provisions have been built into collective agreements that will make it difficult to achieve many of the changes that are needed at OPG.

One issue in particular is the number of supervisors and managers who are members of the Society. Currently, Society members include more than 200 employees whom OPG considers to be performing management functions. This arrangement is a result of a voluntary agreement that Ontario Hydro and the Society reached in 1991.

It will be very hard to ensure the accountability of this layer of management without removing these managers from the bargaining unit or making other substantial changes to the collective agreement. We strongly encourage all parties to make every effort to put in place a more rational arrangement.

700 University Avenue

We have made several recommendations to address shareholder influence which has been a clear factor affecting morale and engagement. We also suggest very strongly that the company and the shareholder look at the impact – both symbolic and real – of the location of OPG headquarters. The current site, directly across Queen's Park Crescent from the Legislature, emphasizes the close ties that have always existed between the electrical utility and the Province. Other Ontario Hydro successor entities, such as Hydro One Inc. and the IMO, have left the neighbourhood.

From a practical perspective, neither the location nor the size of the building may make sense any longer. Downsizing and the de-merger have reduced the number of employees. Beyond that, we believe that as many functions as possible need to be moved into the generating divisions. It would be better for the management teams running the divisions and related services on which they rely to be close to their operations.

This is a decision for the new board and management of OPG, based on financial costs and benefits, but we believe a move – possibly resulting in a much smaller head office – would be good for the company.

We also believe our recommendations on building two strong distinct accountable businesses within OPG will materially contribute to improved culture. Employees will have a better sense of who they work for and how they can make a difference.

Recommendation IV.17

That management of divisions be based in the field at or near the assets for which the division is responsible.

Recommendation IV.18

That the head office of OPG be reduced in size as much as possible as functions are moved to the two key operating divisions and, subject to cost-benefit analysis, be moved away from 700 University Avenue in Toronto.



V. Pickering

Assessing and making recommendations on Pickering A Units 1, 2 and 3 was the most technically complex and urgent matter to confront us.

Unit 4 was one of four units at Pickering A that were taken out of service in 1997 because of regulatory concerns, and so that resources could be focused on upgrades at other nuclear facilities. Unit 4 was the first of the Pickering A units to return to service. We were asked to advise on the potential refurbishment of the remaining three.

The facts around the refurbishment of Pickering A Unit 4 are well known:

- The final cost of the project, at \$1.25 billion, was roughly three times the estimate put forward in 1999.
- The scheduled date for completion slipped by more than two years, from mid-2001 to late September 2003.

In its report last fall, the Pickering A Review Panel, which is referred to as the Review Panel in this report, stated that "management of the project from initial planning to execution was seriously flawed. The Review Panel found that well-established industry practices and steps for carrying out a project of this size and complexity were not followed." It also recognized that the "ultimate responsibility must lie with the OPG Board and senior management and how they exercised their oversight responsibilities." After the release of the report, OPG's Chair, Chief Executive Officer and Chief Operating Officer resigned. The board and CEO have been replaced on an interim basis.

During the time we carried out our work, the interim board of directors of OPG decided to stop all planning and preparation activity on Units 2 and 3 so that they could concentrate their resources on Unit 1. We agree with this decision. In our view, further development work on Units 2 and 3 should not go ahead until it is clear that OPG will be able to succeed at the Unit 1 project.

Our focus in this chapter is therefore on whether Pickering A Unit 1 should proceed. Our assessment of this question is necessarily based on the information available to us at this time. Large construction projects by nature carry risk. Because of the sheer amount of money involved, approvals must be contingent on continued oversight and continued management of project risk. This applies to all well-run projects, whether in the private

or public sector. Controls and checkpoints are essential both before and after construction starts.

In our view the two key questions we had to address are:

- Does the project make economic sense?
- Can the project be done on time and to budget?

The economic analysis showed us that proceeding with the \$500 million investment necessary to complete Unit 1 would result in an electricity cost that is between \$20 and \$30 less per megawatt hour than the cost of electricity from a combined cycle gas plant, the next best alternative for baseload generation.

The revenues from the electricity generated by the project would be sufficient to repay the \$500 million investment required, demonstrating a robust business case in favour of proceeding, with a net present value of between \$95 million and \$235 million.

Achieving this outcome requires completing the project on time and to budget. We reviewed the project intensively with the OPG Unit 1 Project Team and with an independent project oversight team (the Schiff team described below). We asked a series of key questions to assess the readiness of the project.

Ultimately we arrived at the conclusion that the OPG interim board, OPG management, and the Unit 1 Project Team have developed a plan to reduce or eliminate the major sources of the delays and cost overruns that occurred on Unit 4. We believe that the risk on this project has been managed down to a reasonable level but that stringent oversight must continue to ensure project risk remains at an acceptable level.

Based on the above, we are recommending that the Unit 1 project proceed.

Following this overview is a section detailing the economic analysis of the Unit 1 Project followed by a section on the project management status. Our formal recommendations can be found at the end of the chapter.

The economics of the project

For the economic analyses, we drew on the advice of CIBC World Markets Inc. and PJBTO Associates Ltd. With their help, we reviewed the economics of the Pickering A Unit 1 project, examining the project from two perspectives. In the Alternative Supply

Analysis, we compared it to an alternative option for baseload supply. We also carried out a business case analysis.

The estimated remaining cost to complete the Unit 1 project is a range of \$450 million to \$600 million, with the base case estimate being \$500 million. The question we asked is whether investing this \$500 million made economic sense.

Key Findings

Alternative Supply Analysis

- This analysis used a measure called the Levelized Unit Energy Cost (LUEC) that is often used to compare costs consistently across generation options that have different operating lives and cost characteristics.
- On a go-forward cost basis, the electricity cost for the Unit 1 project using LUEC analysis is projected to be between \$20 to \$30 cheaper per MWh (or 2 to 3 cents cheaper per KWh) than that of a combined cycle gas plant running as base load.

Business Case Analysis

- This analysis used a Net Present Value (NPV) approach, which estimates the net value in today's dollars of all the outflows and inflows of a project over a specific number of years into the future. It uses a "discount rate" for future flows that reflects perceived risk.
- The NPV for the project based on go-forward costs and using an electricity price projection based on the current market structure ranges from \$95 million to \$235 million, depending on the discount rate used. An NPV of zero or greater indicates the project is financially feasible.

Below, we first explain the assumptions underlying the analyses and then present the results in more detail.

Key Parameters

To understand the economics of the project, key pieces of information are needed. These include the investment that must be made in the project, as well as such elements as the project's operating life and annual costs. The table below sets out the key parameters. The terms are explained below.

Key Parameters for the Unit 1 Project

Financial Parameters	Estimated Range (March 2, 2004)	Base Case Estimate (March 2, 2004)
Going Forward Project Cost	\$450-600 million	\$500 million
Expected In-Service Date	August 1 to December 1, 2005	September 1, 2005
Capacity Factor	75% - 90%	85%
Average Annual Cost	\$77 - \$108 million	\$86 million
Operating Life Ending	December 2013 to December 2019	December 2017

Going Forward Project Cost: This comprises all costs to complete construction, commission and return the Unit 1 reactor to service, including contractor charges as well as internal OPG project-related spending. If approved, about \$300 million will be spent in 2004 and \$200 million in 2005.

Expected In-Service Date: This is the date on which Unit 1 would begin operating, assuming a construction start of June 1, 2004. The base case estimate assumes 12 months for building followed by three months to complete all final steps and reviews before starting the reactor.

Capacity Factor: This is an industry measure of the percentage of time a plant is operating and producing electricity. A 100% capacity factor would mean Unit 1 was always on. Most reactors go out of service for planned and unplanned maintenance. The less often this happens, the better the economics.

Average Annual Cost: This is the cost for fuel, operations, maintenance, management, repairs, and capital expenditures to sustain the plant's condition.

Operating Life Ending: This estimates how long Unit 1 will produce electricity after it returns to service.

OPG is currently working on producing a tighter estimate of project cost, essentially to reduce the expected range of the outcome. This is expected to be ready at the end of this month.

Weighted Average Cost of Capital and Discount Rate: In performing the analysis, our advisors tested the Unit 1 project using a "weighted average cost of capital" in a range of 10 to 15%. This established the discount rates used to calculate the present value of future cash flows in the project. Generally, the higher the discount rate, the higher the perceived risk of a project. The 10% rate reflects OPG's corporate discount rate and might also reflect OPG's cost of capital under rate regulation. The 15% rate reflects the higher risk profile that might be attributed to a nuclear refurbishment project.

Price of Power: The business case analysis depended heavily on the projected price of electricity. We used a price projection provided by OPG that is based on the current market structure.

We have also tested some options using projected prices at the level that would likely be needed to attract a new 515 MW combined cycle gas plant. This type of gas plant would be the next best alternative to refurbishing Unit 1, because it could be built reasonably quickly and would provide a similar level of output for baseload supply. The projected prices for electricity that would be needed to make the gas plant investment attractive are higher than in our business case analysis. Since higher prices in future would improve the economics of the project, this makes the case for Pickering A Unit 1 even stronger.

Sunk Costs

Total costs of work to date, or "sunk costs," on Unit 1 are significant. With any complex construction project, money has to be invested up front in exploratory work to ensure the budget is accurately developed and potential obstacles are identified. As well, because returning all four units at Pickering A was originally conceived as a single project with multiple phases, some work was completed on Unit 1 while the Unit 4 work was going on. The Unit 1 sunk costs are about \$325 million, placing the total project cost in the range of \$775 to \$925 million. The base case estimate is \$825 million.

Our main focus in each analysis has been on the go-forward cost of the project, compared with the electricity and returns that can be generated from that go-forward investment.

However, it is also important to look at the economics of the project on a total cost basis. Both of our analytical approaches therefore included some analysis using total costs.

Alternative Supply Analysis

As the Task Force indicated, Ontario has an immediate need for additional generation capacity. This analysis compares the cost of the Unit 1 project to an alternative generation option that could supply the same amount of power and be built in a relatively short time.

As noted, LUEC allows the costs of generation options with different characteristics to be compared on a consistent basis. It represents the constant price that must be charged for each unit of electricity generated over the life of that option to exactly recover all life-cycle costs, including the cost of capital. The comparison is most useful when the options serve the same role in the electricity system. In this analysis, for example, both options – Unit 1 and a 515 combined cycle gas plant – provide baseload capacity. While renewables such as wind power might be built as quickly, their operating characteristics present challenges to considering their capacity as baseload.

Using the parameters described earlier, and employing a 10% discount rate, we estimate the going forward LUEC of the Pickering A Unit 1 project to be roughly in the range of \$40 to \$45 per MWh. The gas plant, in contrast, has a projected LUEC of \$65 to \$70 per MWh.

This would result in savings to electricity consumers of \$75 to \$115 million a year. At a 10% discount rate, the present value of the savings over the 12-year operating life of the refurbished Unit 1 ranges from approximately \$500 million to \$800 million.

This analysis shows clearly that the Pickering A Unit 1 project would be less costly to the ratepayers of Ontario than any other baseload generating source that can be developed in the time available.

On the basis of a total project cost of \$825 million and using a LUEC analysis, Unit 1 is anywhere from \$4 to \$18 cheaper per MWh than the gas plant, depending on the assumptions used. This would translate into yearly savings to electricity consumers of

\$15 to \$70 million a year, and the present value of the savings in this case ranges from roughly \$100 million to \$500 million at a 10% discount rate.

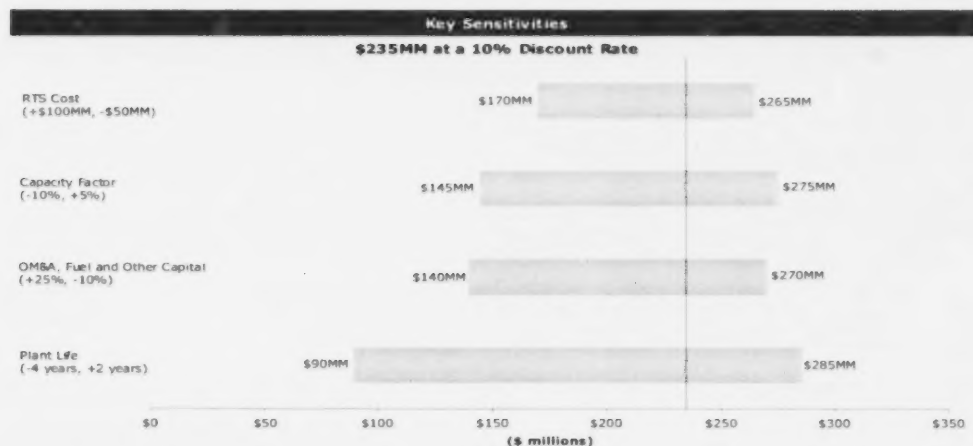
Business Case Analysis

The business case analysis examines the Unit 1 project from the point of view of an investor looking at the net present value (NPV) today of all the money put into an investment and earned by it over time. Because NPV analysis provides a snapshot at a given time, judgement is needed in assessing the results, as these are highly dependent on the assumptions used.

We requested and OPG management provided to us its financial business case analysis. The OPG analysis discounted the cash flows at their corporate weighted average cost of capital of 10%, and projected prices based on the current arrangements for the wholesale electricity market. It also used the key parameters set out at the beginning of this section.

The result of that analysis showed an NPV of \$235 million using the base case parameters of the project. This indicates that the Unit 1 project is feasible based on its go forward cost estimate of \$500 million.

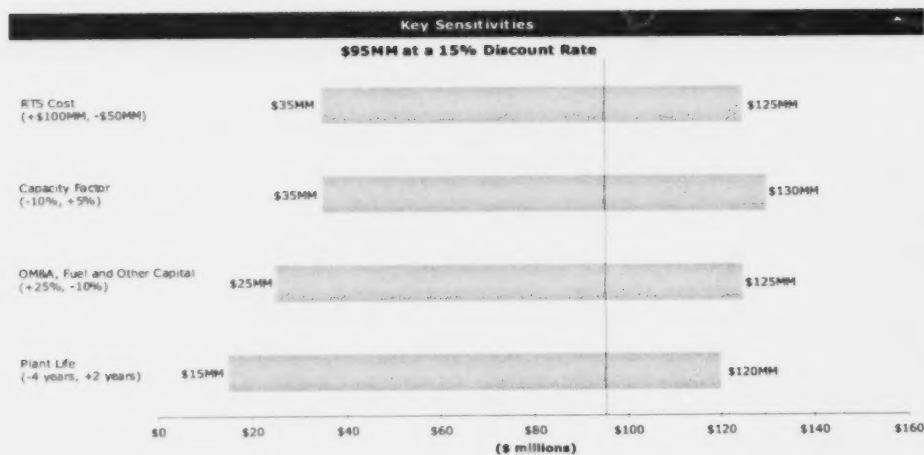
Our financial advisers reviewed the case and tested it for the estimated ranges in the key parameters provided by OPG. This sensitivity testing shows how the NPV would vary if the actual results were lower or higher than the base case estimate. The diagram below shows the results of that testing. As can be seen from this representation, the NPV for Unit 1 is positive for the full extent of all the ranges tested:



If a combination of negative events were to occur, for example:

- a three-month delay in start-up; a \$50 million increase in construction costs; 80% capacity factor; operating life shortened by two years; and a 10% increase in average annual costs, the NPV drops to \$70 million, still a positive figure but less attractive as an investment.

For reasons discussed earlier, our advisers tested the project at the higher discount rate of 15% and with the base case parameters. The resulting NPV was \$95 million. The corresponding sensitivity analysis is shown below and the NPV is still positive over all the ranges shown.



With the electricity price projection used in the analysis and the total project cost of \$825 million, the internal rate of return would be approximately 10%. On a total cost basis, the project would have a positive NPV if the weighted average cost of capital were set at 10% or below.

Uncertainty of Estimates and Risk

Any financial analysis is dependent on the quality of the inputs to that analysis. As noted, the financial analysis in this report is based on the parameters provided by OPG as part of their business case and are the product of a detailed technical analysis.



We, and our financial advisers, have queried OPG management about these estimates and about their confidence in the information provided. In the end, based on the responses we received, we have accepted them as factually based and reasonable for the purposes of this analysis. OPG management recognizes that given the recent history of missed projections both on construction and elsewhere in their operations, it is critical that their estimates be considered and comprehensive.

It should be noted that within the timeframe available to us, it has not been possible to undertake a detailed assessment of the technical analysis and the estimates provided.

The ranges shown in the first chart in this chapter are a way of describing the risk in the estimates of cost that OPG has prepared. For example, the going forward project cost could be as low as \$450 million or as high as \$600 million. Within those ranges, the NPV of the project remains positive, suggesting that the Unit 1 project would be financially feasible.

A risk remains however, that the outcomes of Unit 1 could fall outside the ranges that have been projected. We would caution that no analysis can guarantee a positive outcome.

Conclusion

The alternative supply analysis and the business case analysis generally demonstrates a robust business case for making the remaining \$500 million investment in Unit 1, contingent, as in all projects, on risks and particularly construction risk, being well managed. Management of the construction risk is addressed in the next sections.

Project Management

To help us assess the project management of the Unit 1 project, we drew on the expert advice of Schiff Hardin LLP. To help with the analysis, Schiff Hardin retained two consultants, J. Wilson & Associates and Meyer Construction Consulting Inc.

Schiff Hardin has expertise in project oversight and controls and specific experience with nuclear refurbishment projects. J. Wilson & Associates and Meyer Construction Consulting provided additional in-depth knowledge of project scheduling and construction cost analysis. (The entire team is referred to as "Schiff" in the balance of this chapter.)

Background: The construction challenge

What presents the greatest challenge in the Unit 1 Project is not so much the nature of the work that has to be done, but the amount and the scheduling of that work.

The scope of the work involves:

- Bringing the unit back to working condition; and
- Ensuring it conforms to current licensing and regulatory standards. (Operators of nuclear facilities must be licensed by the Canadian Nuclear Safety Commission.)

The work is split between:

- Modifications, which require engineering work and will be carried out largely by outside contractors (who are referred to in this chapter as the "Prime Contractors"); and
- Non-modification work, which is essentially plant maintenance and will be done mostly by OPG Operations and Maintenance staff.

Although Unit 1 is a nuclear facility, virtually none of the modification work calls for a specialized technical skill on the part of the Prime Contractors. In fact, almost all of the craft labour (that is, electricians, pipe fitters and so on) will be hired from local union halls.

The number of tasks involved in the work, however, is large: about 8,000 modification and 8,000 non-modification tasks. Scheduling these into an efficient integrated process, especially in light of the security, safety and regulatory procedures at a nuclear facility, is critical to success.

In addition to the sheer volume of work, the major complicating factor for the Prime Contractors is the fact that Unit 1 still contains nuclear fuel.

Because of the design of the Pickering A reactors, which are all CANDU 600 models designed by Atomic Energy Canada Limited, the reactors do not have to be defueled for maintenance outages.

When the reactors were laid-up in 1997, the company intended to return the units to service relatively quickly and so did not defuel them. It is not economically viable now to defuel the unit before construction starts.

Having fuel in the reactors during the project means that radiation safety protection rules for an operating nuclear plant must be followed. Consequently:

- OPG's Operations and Maintenance staff must closely monitor the work of the Prime Contractors.
- The work must be performed under Plant Operations and Maintenance access-to-work procedures.

Role of OPG

OPG is currently acting as the project manager, as well as engineer and general contractor, on the Unit 1 project. Given the results of the Unit 4 project, a central question is the role that OPG should play if the OPG board approves the Unit 1 project.

Because of the nature of the project, OPG staff must be extensively involved. As the licensed operator of the fuelled reactor, it has responsibility for plant safety and for ensuring that the work meets all licensing requirements. Also, OPG staff will carry out the non-modification tasks.

There are compelling reasons why OPG should remain in the role of project manager. Doing otherwise would likely result in higher risks and costs, for these reasons:

- Preparations for Unit 1 are at an advanced stage. Transferring project management to a third party at this point would result in delays and carry a different set of risks. Any third party would have to re-validate engineering and planning assessing, resulting in increased costs.
- Another project manager would likely not be willing to take on financial and scheduling risks that arise from factors beyond its control, such as the requirements arising from the fuelled state of the reactor and the need to use OPG staff for the non-modification tasks.

- Many of the “lessons learned” from the Unit 4 project relate to OPG activities, such as the access to work site permits. OPG may be in a better position to manage critical elements of its own performance than a third-party project manager.

We found that OPG is in the process of overcoming the problems that plagued Unit 4. Based on the assessment Schiff provided to us, we have concluded that the current Project Team is capable of successfully managing the project to completion. Schiff also noted the many steps that the OPG management and Project Team have taken to apply the lessons that were learned from Unit 4.

Given the necessity for a high level of OPG involvement, and the risk and limited benefit of transferring project management at this stage, we have concluded that maintaining OPG as the project manager is the best option available if the Unit 1 project goes ahead.

Furthermore, we think that the capacity OPG is developing in project management will be invaluable in future projects, even where OPG is not the project manager. OPG needs a core set of skills in such areas as scheduling and budget development to effectively manage its relationships with external service providers, including outside project managers. This will primarily benefit construction and refurbishment but could also benefit other parts of the organization.

Project Methodology and Lessons Learned

Setting up and following a robust methodology is critical to any major construction project, whether nuclear or otherwise. A key part of that is learning from past mistakes. This involves:

- Analyzing and fully understanding the root causes of problems that occur on the first part of a multi-phase project;
- Translating that knowledge into a plan for making improvements; and
- Taking action on the plan so that the problems do not recur in the following stages.

This approach was used to analyze the fundamental problems that occurred in virtually every aspect of the Unit 4 project. The table below describes the key lessons that were learned from the root cause analysis of Unit 4 that are being applied by the Unit 1 Project Team.

This also provides a list of key elements common to virtually every large construction project. A version of this table with details of Unit 1 status and Unit 4 history appears in Appendix F.

PROJECT METHODOLOGY - Key Lessons Learned	
A.	Project scope must be fully developed and frozen.
B.	Project budget must be based on completed scope and a defined project schedule.
C.	Steps precedent to construction must be completed before construction starts.
	1. Engineering must be complete
	2. Relevant planning and assessing must be completed for each phase of construction.
	- Planning and assessing prepares CWPs and accurate bills of materials for the ordering of parts and equipment
	3. Detailed schedule must be completed and updated
	4. Materials ordered, stored on-site and ready for delivery to workforce
	5. Efficient and productive relationship is needed between Prime Contractors and OPG Operations & Maintenance
	6. Contingency plans must be in place to deal with the unexpected.
D.	Project controls and metrics must be in place.
	1. A commodity-based "earned value" must be tracked
	2. Performance metrics established for OPG support departments
E.	OPG Project Team must demonstrate capability to manage the project.
F.	Effective contracting strategies must be developed.
G.	Project team must provide accurate information to senior management and the board of directors.

In the following sections, we discuss progress on the project and the plans under way to deal with challenges.

Progress on Unit 1

The report of the Pickering A Review Panel divided the failings of the Pickering A Unit 4 project into five major categories. These were:

- project assumptions;
- project management;
- cost and schedule estimates;
- management effectiveness; and
- cost and performance reporting.

We used these categories to assess the current status of the project and judge whether the Unit 4 problems have been addressed. We are satisfied that OPG has addressed these problems and is managing them. As further assurance, the Project Team is subjecting itself to rigorous ongoing monitoring and oversight.

1. Project Assumptions

The Project Team has carried out a thorough due diligence review of the scope of the Unit 1 project. This included incorporating into the Unit 1 engineering two important elements:

- the relevant field changes that were required on Unit 4; and
- detailed walk-downs of the Unit 1 site both by OPG and contractors to identify omissions and confirm constructability.

All known regulatory requirements have also been included in the scope of engineering work for Unit 1, which was not the case with Unit 4 at a comparable point in the planning. In fact, the scope of the work on Unit 4 was not frozen until almost the end of construction.

Engineering for Unit 1 is effectively complete. OPG and contractor field reviews have tested it and found it to be robust. Incomplete engineering was a principal flaw on Unit 4.

2. Project Management

With the scope of the Unit 1 project frozen, the Project Team is developing a detailed, critical path schedule. All parties are expected to sign off on the completed schedule in May.

As well, the Project Team:

- Has set up procedures to track progress on the preparatory phase of the project and is regularly reviewing this information with OPG senior management.
- Has made substantial progress in defining the respective roles and responsibilities of the key participants in the project, internal as well as external. This should be complete before construction starts.
- Is continuing to develop communication protocols and contingency plans. This should be complete before construction starts. Clear lines of communication and clear accountabilities, which are essential to a successful project, were never established on Unit 4.
- Is ensuring that the planning and assessing phase, in which the work scope and tasks are detailed for field construction, is sufficiently advanced that it will not interfere with the start of construction. In contrast, on Unit 4 this was done in the field well after construction had started. The Unit 1 Project Team is committed to completing planning and assessing to support the construction schedule.
- Has ensured that between 70 and 80% of the materials needed for the entire project are already on-site, and specialty long-lead items are either available or on order to meet schedule. Materials availability was a problem on Unit 4.
- Has retained an external Project Adviser, who has extensive construction expertise in both new nuclear and refurbishments, to mentor the team and to advise the Project Manager in dealing with critical issues.

- Has developed a plan to reduce the work-access permitting bottleneck. On Unit 4, inefficient OPG procedures for issuing access to work permits caused delays of up to three to five months. The new approach is discussed in more detail below.

As well, the senior executive at Pickering A (who is the head of the Project Team) has made a written commitment to OPG senior management that construction will not be mobilized until all pre-requisite conditions have been met and tested. The premature start of construction was a major problem in Unit 4.

3. Cost and Schedule Estimates

The Unit 1 budget has been developed at the correct stage, after substantial progress has been made on engineering, Planning and Assessing, and drawing up a project schedule. On Unit 4, budgets were constantly revised because they were prepared before all the necessary steps were complete.

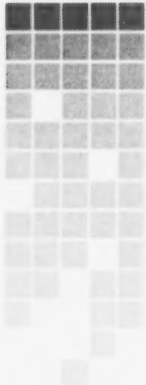
To better define the budget, the Project Team started a process in the fall of 2003 to have Prime Contractors provide estimates on detailed design drawings on a task-by-task basis. An independent review of these estimates revealed a flaw in the process. The estimates are now being adjusted. This process will ultimately provide greater certainty for both cost and schedule.

4. Management Effectiveness

Management and the Project Team have used the Lessons Learned from Unit 4 to create and act on a plan to avoid the recurrence of problems.

Management now clearly recognizes the complexity and risk of a major construction project. An oversight structure has been established that includes an independent oversight team, Schiff, that is responsible and accountable to the board of directors. Regular meetings bring together the Chair of OPG, key members of OPG senior management, Schiff and the Project Team.

As well, the OPG Chair is establishing an oversight panel with external experts in nuclear and construction matters. This oversight panel will meet periodically with the Project Team and Schiff and report to the board of directors.



OPG has made key changes to the Project Team to add the expertise and depth needed for the Unit 1 project.

The degree of oversight adopted with respect to this project is unusually intense and reflects the fact that during the Unit 4 project, the board and senior management did not receive the information required to be able to accurately assess progress on the project.

Project Team members have submitted themselves to an open review of the precise status of progress, and to identifying clearly and as early as possible every known hurdle to success.

5. Cost and Performance Reporting

A new project controls system, with the needed software tools, is being put in place. Project information from the new system already exceeds anything generated for Unit 4.

Work is advanced on a stable work breakdown structure to compare the hours of work performed on the project with the materials estimated, used and installed. This will allow the determination of "earned value" (a basic measure of productivity on a construction project) against hours of work expended, an indicator of how productively labour is being used. The new system should allow earned value to be tracked on a daily basis.

Performance metrics are being set for OPG support and administrative staff, with tracking tools similar to those in use for external contractors.

In sum, there has been and continues to be considerable activity on the part of the Project Team to improve the potential outcome of the project. However, significant challenges remain. The next section discusses these in more detail and outlines the steps being taken to address them.

Remaining Challenges

The following challenges for Unit 1 have been identified to us:

- OPG is the combined owner/project manager/engineer for the Unit 1 project. As a result:
 - OPG carries significant risk for the performance of the project.

- OPG carries additional risk of construction claims for "owner interference" from the Prime Contractors that could add to costs.
- OPG will have a large overhead for support staff once construction starts. Delays in the schedule will thus directly affect OPG's cost.

Unlike the Unit 4 project, managers this time are clearly aware of the risks associated with their role on the project. Thorough work on project management essentials such as engineering and scheduling is the primary way of managing these risks. Despite the risks, it is critical that OPG perform the project management function for reasons discussed above.

- OPG procedures for issuing access to work permits could cause delays. As the licensed operator of the facility, OPG is responsible for managing these permits, which are necessary for safety reasons. However, the efficiency of the permit procedures is essential.
 - Having only one sign-in window for work crews on Unit 4 resulted in delays of two to three hours every day, which had a very large impact on the total construction time.
 - For Unit 1, OPG has added four Maintenance Authorities, in addition to the permit window, who will also be able to issue work access permits and will be available two hours before the start of each shift. The Project Team will need to monitor this approach closely once construction starts.

If the bottleneck problem is not reduced, it could significantly extend the schedule and as a result, the cost.

- The preparation of Comprehensive Work Packages (CWPs) is behind schedule. CWPs, which are prepared by the Planning and Assessing department, are used as the instructions for work in the field. The initial goal was to complete this stage before the tentative start date for construction of June 1.

Based on the rate at which the work is now being carried out, it is expected that CWPs will be 80% complete by June 1 and fully complete in July 2004. If this

schedule is met, there should be no impact on the construction, which is planned to start June 1 using the CWP's needed to support that phase of the work.

- The processes that OPG initially directed the Prime Contractors to use for detailed design package estimates were flawed.
 - Standards and factors in the estimating guide that OPG gave to contractors proved to be excessive and resulted in unduly high estimates and unduly long durations for the work.

Once the problem was identified, OPG held a series of meetings with contractors. Most of the contractors are now committed to making the estimates more accurate and if anything, the initial estimates should prove to be high.

- The form of contract with the Prime Contractors is still under negotiation.
 - The Project Team is seeking a form of contract that would allow the Unit 1 project to set a reliable budget.
 - Extensive efforts are being made to address issues such as access to work site that could have an impact on the form of contract.
- Project controls have been introduced and include software new to the company.
 - OPG and its Contractors are getting used to the new system and, despite the learning curve and some unresolved software issues, are generally positive.

Is the Project Ready?

We have just described the significant challenges to this project. More challenges will arise. Every complex and large construction project carries risk that cannot be avoided. The question for us is whether the risks on the project are being and will continue to be adequately managed, and whether the projected budget and schedule will be met.

We have examined the root cause analysis of Unit 4, and the application of the "Lessons Learned" to the Unit 1 project. We have reviewed the progress made against the issues described by the Review Panel. Following are the questions that we felt we had to answer to be able to arrive at a recommendation on Unit 1.

OPG Review Committee

- Is the information we have received about the project useful in making a recommendation, and are we confident about the quality and timeliness of it?
 - We have met with the Project Team.
 - Committee staff have been present at meetings between the Project Team and the Prime Contractors.
 - We have met with Schiff frequently and received detailed information from them about the status of the Unit 1 project, as summarized above and in Appendix B.
 - Schiff was consistently available to clarify any questions we had. They updated information to us almost to the day this report went to printing.

Based on those facts, we are confident about the quality, timeliness and usefulness of the information we have received.

- Given the information available to us, do we believe the root causes of the problems on Unit 4 have been addressed on the Unit 1 project?
 - As the material above on "Lessons Learned" sets out, OPG senior leadership and the Project Team have identified the root causes of the Unit 4 problems.
 - They have taken action to address the problems.
 - In most cases, their actions have significantly reduced the risk of recurrence.
 - There are remaining challenges that are still being dealt with, as outlined above.

Based on these facts, we believe that the root causes that have been identified are being successfully addressed. The oversight structure that has been established provides additional assurance that this is the case.

- Do we believe that the Project Team has the capacity to manage the project?

- 
- The Project Team has successfully completed the engineering phase, which was the source of much of the delay on Unit 4.
 - The team has made progress in applying lessons learned.
 - The team has added management depth to the construction division.
 - Schiff has concluded that the current Project Team is capable of successfully managing the project to completion.

We concur with Schiff that the evidence is there to show sufficient capacity for this project.

- Are the projected budget and schedule well founded?
 - There has been a thorough due diligence of the scope, and the scope includes all of the regulatory requirements.
 - A detailed schedule is in development and the current version has been tested with contractors.
 - Budget development is based on completed engineering, on walk-down estimates, on substantial completion of planning and assessing, and on a detailed schedule.

It is our conclusion that the budget and schedule development has been thorough and can be substantially relied upon.

- Are there appropriate project controls and oversight going forward?
 - Project control systems have been established.
 - Performance metrics have been developed for contractors to allow calculation of earned value on a daily basis.
 - Performance indicators are in development for all OPG support departments to track productivity and efficiency.
 - Schiff will continue to report to the board of directors. Schiff, along with the Project Team will also meet regularly with an oversight panel with both

board of director and external expert membership to review progress in detail.

We conclude that there has been substantial progress in project controls and project oversight issues.

- Unexpected delays frequently occur on major construction projects. Are there contingency plans to manage risks that might cause delays?
 - A team has been established to manage emerging risks.
 - This structure will allow for a rapid response to unforeseen events.
 - Common occurrences that arise with construction projects, like equipment failures, have been anticipated, and work arounds are being prepared.
 - We understand that the Project Team is continuing to develop clear roles, responsibilities and lines of communication.
 - This will allow the right individuals to be notified and to take action to reduce the impact on the critical path of the schedule.

We conclude that the Project Team is taking steps to ensure that unforeseen risks can be addressed quickly and effectively as they emerge.

- Given that all construction projects carry some degree of risk, has the risk of cost overruns and schedule delays been reduced to a reasonable level?
 - The best way to manage that risk is through a diligent and thorough preparation, through clear roles and accountabilities, and through using oversight to provide appropriate checks and balances.
 - OPG is working on a contractual strategy to ensure budget and schedule adherence.
 - Schiff has stated that "Despite any of the aforementioned risks, the Unit 1 Project is eminently feasible, and the potential problems the Project may

encounter should not exceed the risks OPG has identified and anticipates for the Project.”

It is difficult to determine the residual risk on any particular project, but it is clear to us that a consistent effort has been made to reduce or eliminate the possible impacts of major sources of delay and thus of cost.

We have evaluated the evidence and concluded that the Project Team is making a sustained effort to manage the Unit 1 project in a professional manner. Early signs of success verify this conclusion. Impediments to that success have also been encountered, but the Project Team is openly discussing and addressing these.

Nuclear projects are by nature more complex to administer than others, but having reviewed the above questions, we think that the degree of risk on this project has been managed down to a reasonable level. However, this effort must continue. Risk is not static and must be reassessed on a continuing basis. Notwithstanding our conclusion that the project risk is reasonable at this time, certain milestones must be met before construction starts.

Milestones

The OPG board of directors will soon face a decision on full-funding approval. Schiff has advised that approval be conditional on meeting the following fundamental milestones no later than the start of construction:

- Scope of the project must be frozen;
- Contracts with the Prime Contractors must be agreed-to in principle or be in place;
- Prime Contractors and OPG must agree to a detailed, critical path schedule;
- The Project’s baseline budget including contingency reserves must be fixed ;
- Project Control metrics must be in place and capable of tracking earned value of the work;
- OPG and its contractors must have in place a cost reporting system which tracks major commodity work (quantity and unit cost);

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- The Project Team must have a stable staffing plan that details the ramp-up of resources necessary to meet the needs of the construction phase;
- Contingency plans for potential schedule delays must be established;
- A Communication Plan which dictates day-to-day interaction and emergent issue management must be prepared and accepted by the Project Team and the Prime Contractors;
- A detailed description of major roles and responsibilities must be fully developed and accepted by the Project Team and Prime Contractors;
- The process for change order review and approval must be in place and accepted by the Prime Contractors;
- The modification work scope must be fully allocated among the Prime Contractors and accepted by the same;
- The OPG procurement department must have all materials for the first three months of the construction phase kitted and ready for delivery to the work force;
- The OPG procurement department must have all long lead items on order or in OPG's possession so as to support the schedule;
- OPG Operations and Maintenance must develop and disseminate streamlined written permitry rules that both meet the needs of plant safety while at the same time being acceptable to the Prime Contractors so that their means and methods are not unduly disrupted;
- OPG's Planning and Assessing Department must have completed the CWP's for the first four months of the Project;
- Necessary pre-requisite work on the breathing air, control room air conditioning, cranes, scaffolding and basic services needed to support construction must be complete; and

- OPG management must establish a process for reporting project status on a regular basis to the OPG board.

As we have discussed in this chapter, we are confident that the Project Team and the oversight bodies are closely focused on ensuring these milestones are met and they will continue to manage the project so that risk remains an acceptable level.

Recommendations

Based on the information available to us at this time, we make the following recommendations:

Recommendation V.1

That OPG proceed with the project to return Pickering A Unit 1 to service.

Recommendation V.2

That the board of OPG maintain the highest level of oversight for the duration of the project, including monitoring by third-party experts with direct accountability to the board.

Recommendation V.3

That the board of OPG wait until there is clear evidence of success on the Unit 1 Project before proceeding with any further development work on Unit 2 or 3.

Recommendation V.4

That the same level of due diligence applied on the decision to proceed with Unit 1, including a business case analysis, be applied to any decision on Units 2 and 3.

VI. Concluding thoughts on building success

We have sought in this report to reply fully to the questions put to us by the government with respect to the future role, structure and governance of OPG, as well as the return to service of Unit 1 at the Pickering A nuclear generating station.

Almost from the outset of our work it was clear to us that the biggest problem facing Ontario's electricity sector right now is supply. While most of the recommendations in our report require OPG to take action, we believe that the key to a healthy electricity sector, so fundamental to a strong economy, rests in actions that the Government of Ontario must take.

We say without hesitation that we are in a supply crisis. We cannot rely solely on markets to solve our problem: no jurisdiction in the world has ever done so successfully. We need a core competency in the public sector now, more than ever. We need a strong and stable OPG.

To build success, we urge the government to act quickly on the following matters:

1. Stabilize the electricity sector.

The government must establish the policy environment in the sector and start planning immediately on meeting future supply needs.

While we were not given the specific task of offering our views on the design of the sector going forward, we have clearly offered some advice in this area, particularly as it concerns regulating OPG.

Whether or not that particular view is accepted, it is key that the policy framework be clearly articulated and, if necessary, legislated in the near future, to create a stable policy environment for the electricity sector.

While we recognize the need to encourage conservation and develop renewable energy sources, it is also imperative that the government put in place a competent authority, at arm's length from it, to forecast future supply needs and begin the steps to meet them.

Achieving the goals of self-sufficiency, diversity of fuel source, reliability, and reasonable prices will require careful and thoughtful planning, as well as some crucial decisions. There is truly no time to waste.

2. Stabilize OPG

OPG is simply too important to Ontario for it not to be run well. The government must therefore declare, quickly and credibly, that it will allow OPG to function free of political interference.

We have made many recommendations about clarity of mandate and improved governance at OPG. For these measures to succeed, the company must have the right leadership. As well, ensuring the success of the Unit 1 project will require the highest level of diligence on the part of the OPG board. For these reasons, the government must ensure a strong and certain leadership at OPG. Given the problems of the recent past, the current interim arrangement for the board and CEO is understandable. If the major renewal of the company and refurbishment of Unit 1 are to be carried out properly, however, the interim arrangement must end.

We therefore urge the government to confirm the Chair and appoint additional qualified directors to the OPG board without delay. They can then get on with the job of moving OPG forward. The Chair and the board must have the right to hire and fire senior managers and make all key decisions affecting them. The Chair and senior management will then build the team needed to move OPG forward. They will lead in bringing about the change in OPG culture that is crucial if the company is to improve.

3. Finalize a decision on Pickering A Unit 1, and establish independent monitoring

We have identified the refurbishment of Pickering A Unit 1 as the quickest and least costly source of additional electricity supply available to Ontario. Given the supply challenges the province faces, we have recommended that the project go ahead. The government should consider as soon as possible our recommendation, and if it agrees, the project should proceed with the least possible delay.

If the Pickering A Unit 1 project goes ahead, the government, as shareholder, should set up a process to ensure ongoing oversight. Given the recent history of cost overruns, taxpayers deserve this additional protection of their interests. The government should seek to have regular independent reports on how the project is progressing, whether

milestones are being met, and how closely OPG is adhering to schedule and cost estimates.

Serving the public interest

Ontario has a long and proud history of public ownership of power generation assets. Unfortunately, public ownership is not, in and of itself, a guarantee that the public interest will be well served.

We believe, however, that it is possible for a government-owned electricity generating company to be empowered and accountable to reach a standard that matches the world's leading performers. Citizens of Ontario have the right to expect nothing less.



Appendix A - Biographies

The Honourable John Manley, P.C., M.P., B.A., LLB, Chair

John Manley has served as a Liberal Member of Parliament for Ottawa South since 1988 and as a Cabinet Minister from 1993 to 2003.

Mr. Manley was appointed Minister of Industry in 1993. In this portfolio, he worked to foster innovation among the 13 agencies of the Industry portfolio and to secure Canada's position as a global leader in high technology.

In 1996 Mr. Manley was given additional responsibilities. He was appointed Minister responsible for the Atlantic Canada Opportunities Agency, Minister of Western Economic Diversification and Minister responsible for the Economic Development Agency of Canada for the regions of Quebec.

Mr. Manley was appointed Minister of Foreign Affairs on October 17, 2000. During Mr. Manley's tenure in this portfolio, Canada hosted the historic Québec City Summit of the Americas in April 2001.

Following the shocking terrorist attacks against the United States of September 11, 2001, Mr. Manley was appointed by the Prime Minister as Chairman of a new Cabinet Committee on Public Security and Anti-terrorism, where he coordinated Canada's domestic and international response to the attacks.

In January 2002, Mr. Manley was appointed Deputy Prime Minister of Canada, Political Minister for Ontario, and continued to serve as Chairman of the Ad Hoc Cabinet Committee on Public Security and Anti-Terrorism. He has also served as Minister of Infrastructure and Crown Corporations, and as Chairman of the Cabinet Committees on Economic Union and Social Union. In June 2002, Mr. Manley was given additional responsibilities when he sworn in as the Minister of Finance.

Mr. Manley graduated from Carleton University with a Bachelor of Arts degree in 1971. He then studied law at the University of Ottawa, graduating in 1976. From 1976 to 1977 he served as Law Clerk for the Right Honourable Bora Laskin, Chief Justice of Canada.

The Honourable Jake Epp, P.C., B.A., B.Ed., LL.D., Chairman

Jake Epp is Chairman of Ontario Power Generation Inc. (OPG). He was appointed to this position in December 2003.

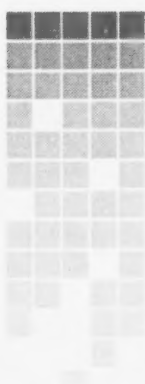
OPG is an Ontario-based electricity generator whose principal business is the generation and sale of electricity in Ontario and to interconnected markets, while operating in a safe, open and environmentally responsible manner.

In May 2003, Jake Epp was appointed by the Ontario government to lead a panel to review the delays and cost overruns at the Pickering A nuclear generating station. The findings of the report were released in December 2003.

Mr. Epp was a Member of Parliament for the riding of Provencher, in Manitoba from 1972 to 1993. He also held three cabinet posts: Minister of Energy, Mines and Resources (1989 – 1993); Minister of National Health and Welfare (1984 – 1989); and Minister of Indian Affairs and Northern Development (1979 – 1980).

From 1993 to 2000, he was Senior Vice President and Vice President at TransCanada PipeLines Ltd.

Mr. Epp graduated from the University of Manitoba with a B.A. in 1961 and a B.Ed. in 1965. He was appointed to the Privy Council of Canada in June 1979 and received an LL.D. (Honourary) from Trinity Western University in 1988.



Peter C. Godsoe, O.C.

Peter Godsoe is the former Chairman and Chief Executive Officer of The Bank of Nova Scotia.

Mr. Godsoe began his career with the Bank in 1966 in Ottawa, Ontario. After serving in Toronto and Montreal, he moved to New York and rose rapidly through various positions in international, corporate and investment banking to become Vice Chairman of the Board in 1982. He was elected President and Chief Operating Officer in 1992, Chief Executive Officer in 1993 and Chairman in 1995.

Mr. Godsoe holds a B.Sc. in Mathematics and Physics from the University of Toronto, which he attended on a scholarship in mathematics and french. He also holds an M.B.A. from the Harvard Business School, and is a C.A. and a Fellow of the Institute of Chartered Accountants of Ontario. In 1993, Mr. Godsoe accepted the degree of Doctor of Civil Law honoris causa from University of King's College, in June, 1995 accepted the degree of Doctor of Laws honoris causa from Concordia University and in October, 2001 accepted the degree of Doctor of Laws honoris causa from the University of Western Ontario. In 2002, Mr. Godsoe became a member of the Canadian Business Hall of Fame and an Officer of the Order of Canada.

In addition to The Bank of Nova Scotia, Mr. Godsoe's corporate directorships include Empire Company Limited, Fairmont Hotels & Resorts, Ingersoll-Rand Company, Lonmin PLC, Rogers Communications Inc. and Templeton Emerging Markets Investment Fund. In addition, he is affiliated with a number of non-profit institutes.

Mr. Godsoe lives in Toronto with his wife Shelagh and has three children: Craig, Eden and Cynthia.

Appendix B - Consultation Summary

AECL

Association of Major Power Consumers of Ontario

Association of Power Producers of Ontario

Auto Parts Manufacturers Association

Barker, Dunn and Rossi

Bruce Power

Calpine

Cameco

Canadian Chemical Producers' Association

Canadian Gas Association

Canadian Nuclear Safety Commission

Canadian Petroleum Products Institute

Canadian Wind Energy Association

Electrical Distributors Association

Electricity Market Investment Group

Energy Probe

EPCOR

Hydro One



IMO

Institute for Competitiveness and Prosperity

International Energy Association

Ministry officials from Finance, Energy, and Natural Resources

OEB

Ontario Chamber of Commerce

Ontario Clean Air Alliance

Ontario Energy Association

Ontario Forest Industries Association

Ontario Mining Association

Ontario Water Power Association

OPG

Pollution Probe

Power Workers Union

Public Power for Ontario

Schiff, Hardin and Waite

Sierra Club

Society of Energy Professionals

Appendix C - Reference Materials

Reference Item	Source	Production Date
10 Year Outlook: An Assessment of the Adequacy of Generation & Transmission Facilities to Meet Future Electricity Needs in Ontario	Independent Electricity Market Operator	March 31, 2003
A Framework for Competition	Advisory Committee on Competition in Ontario's Electricity System	May-1996
Annual Information Form	Ontario Power Generation	December 31, 2002
Corporate Aftershock - The Public Policy Lessons from the Collapse of Enron and Other Major Corporations	Christopher L. Culp and William A. Niskanen, CATO Institute	2003
Curbed Enthusiasm for Electricity Reform	The Conference Board of Canada	May 1, 2003
Direction for Change: Charting a Course for Competitive Electricity & Jobs in Ontario	Ontario Ministry of Energy, Science and Technology	November-1997
Electricity Restructuring Acting on Principles	The Conference Board of Canada	June-2003
Electricity Restructuring Letting Prices Work	The Conference Board of Canada	September-03
Electricity Restructuring Securing Clean Power	The Conference Board of Canada	June-2003
Energy Plan to Create Investment, Jobs, Prosperity	British Columbia Ministry of Energy & Mines	November-2002
Greening Ontario's Electricity Sector: From Crisis to Opportunity	Torrie Smith Associates	October 29, 2003
International Energy Outlook 2003 - Coal	Energy Information Administration	May 1, 2003

Measuring the Health Costs of Air Pollution	Gary Koop, Lise Tole & The World Bank	July-2002
New Energy Directions - A Low-Cost, Low-Risk Electricity Supply Strategy for Ontario	Ontario Clean Air Alliance	February 26, 2004
Nuclear Power in the OECD	World Nuclear Association Annual Symposium	September 1, 2001
Nuclear Technology Review 2003 Update	International Atomic Energy Agency	September-2003
Ontario Power Generation Annual Information Form - 2002	Ontario Power Generation	December 31, 2002
OPG Nuclear Report Card	Ontario Power Generation	4th Quarter 2003
Pickering A Unit 1 Return to Service Readiness Assessment	Schiff Hardin LLP	March 15, 2004
Power Generation Investment in Electricity Markets	International Energy Agency	2003
Power Play: The Fight to Control the World's Electricity	Sharon Beder, The New Press	2003
Report of the Pickering "A" Review Panel	Pickering Review Panel	December-2003
Schwarze Pumpe Lignite-Fired Power Plant	CARNOT Online	January-2004
Ten Steps to a Governance Check up	Public Policy Forum	2002
The Case for Public Power for Ontario	www.publicpowerforontario.ca	December 15, 2003
The Politics of Power	Neil B. Freeman	1996
Tough Choices: Addressing Ontario's Power Needs	Electricity Conservation & Supply Task Force	January-2004
What Will Keep the Lights on in Ontario	C.D. Howe Institute	December-2003

Appendix D - Glossary

Base Load

The minimum continuous load over a given period of time.

Biomass

Energy resources derived from organic matter, including wood, agricultural waste, and other living-cell material that can be burned to produce heat energy.

Capacity

The maximum power output for which a generating unit, generating station or other electrical apparatus is rated. Common units include kilowatts (kW) and megawatts (MW). Also used to refer to the maximum potential output for the entire electricity system.

Co-generation

The combined production of electricity and useful heat. Co-generation is often employed at industrial plants where the heat produced to generate electricity can be utilized subsequently in the manufacturing processes and for general space heating. Co-generation facilities use significantly less fuel to produce electricity and thermal energy than would be needed to produce them separately.

Combined Cycle Gas Plant

An electricity generating station that uses waste heat from its gas turbines to produce steam for conventional steam turbines.

Conservation

Any activity which reduces the amount of electricity used overall, or shifts the consumption of the electricity from a peak time to a time of lower demand.

Demand Side Management

Measures undertaken to control the level of energy usage at a given time, by increasing or decreasing consumption or shifting consumption to some other time period.

Emission

A discharge into the air, land, or water from an industrial process, transportation vehicle, household activity, or other source.

Fossil Fuel

Remains of organisms embedded in the earth's crust, with high carbon and/or hydrogen content and used as a source of energy (e.g. coal, oil, natural gas).

Generator

An entity that owns / operates an electricity generating plant.

Gigawatt-hour (GWh)

One million kilowatt-hours.

Grid

A network of electric power lines and connections.

Independent Electricity Market Operator (IMO)

A non-profit, regulated corporation established by the Electricity Act. Roles involve overseeing the operation of the wholesale electricity market and managing the reliability of the high-voltage power system.

Kilowatt (KW)

1,000 watts (W) or 1.34 horsepower (hp).

Kilowatt-hour (KWh)

The amount of electrical energy produced or consumed by a one-kilowatt unit for one hour (1,000 watt hours).

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Market Power Mitigation Agreement (MPMA)

An agreement negotiated between the Market Design Committee and Ontario Power Generation Inc. (OPG) as a means to mitigate OPG's market power in Ontario's wholesale electricity market. Parts of it are, as a result of a directive issued by the Minister of Energy, conditions of license for OPG. The MPMA sets out market share reduction targets for OPG and provides incentives to meet these targets. In addition, the MPMA rebate mechanism provides a measure of protection for Ontario consumers of electricity against high prices.

Megawatt (MW)

1,000 kilowatts (kW) or one million watts (W). Unit of electrical power commonly used to measure the capacity of a generating station or the maximum demand of a large electricity consumer.

Megawatt-hour (MWh)

A measure of the electricity produced by a generating station over time; 1 MW of power produced for 24 hours provides 24 MWh of electricity (as does 24 MW produced for one hour).

Non-Utility Generators (NUGs)

Generators owned by entities other than an electric utility. Also referred to as Independent Power Producers (IPPs).

Nuclear Power

Power generated at a station where the steam to drive the turbines is produced by an atomic process, rather than by burning a combustible fuel such as coal, oil or gas.

Ontario Energy Board (OEB)

A regulatory agency of the Ontario Government. It is an independent, quasi-judicial tribunal created by the Ontario Energy Board Act. Although it reports to the Legislature through the Minister of Energy, the Board operates independently from the Ministry and all other government departments in the performance of its regulatory functions and responsibilities.

Ontario Power Generation (OPG)



A company established by the Electricity Act, 1998, whose principal business is the generation and sale of electricity to customers in Ontario and interconnected markets. It is 100% owned by the Province of Ontario.

Public Utility

An organization that provides basic services to the public, such as water, energy, transportation, or telecommunications.

Performance Based Regulation: A system of regulation in which the regulator approves rates for several years, but builds annual productivity improvement targets into the approved rates. This is intended to give the utility an incentive to improve cost control, since any profits flowing from improvements beyond the productivity targets remain with the utility. This differs from traditional cost-based regulation in which the utility is allowed to charge rates that cover its costs including an allowed rate of return. Rates would be set each year based on a cost of service hearing.

Price setting fuel: In wholesale electricity markets such as Ontario's, the price setting fuel is the fuel use to produce the offered price of the last unit of power accepted by the market operator. The market operator stacks the offers for each time period in ascending order of price, and beginning with the lowest priced offer, accepts offers up to the amount needed to match demand (load) for the period.

Rate Regulation: The process by which regulatory bodies determine the rates charged to customers in regulated industries, including gas and electricity. In Ontario, the Ontario Energy Board sets rates for natural gas distribution and electricity transmission and distribution based on cost estimates submitted by the utilities and allowances of an approved capital structure and return on capital. These costs are scrutinized by the Board prior to setting the rates.

Regulator

An entity that, through power of law or some other legitimate means, has the authority to impose regulation.

Renewable Energy Sources

Energy sources that are renewed by natural processes including wind, biomass, solar, geothermal, water, and tidal.

Reserve Margin

The amount of generation capacity that must be available to meet unexpected reductions in supply.

Solar Power

The radiant energy of the sun that can be converted into other forms of energy, such as heat (e.g. for water heating) or electricity.

Spot Market

A market in which goods are traded for immediate or near-immediate delivery. In the IMO administered electricity market, bids to buy or sell electricity determine a market clearing price.

Supply Mix

The supply mix refers to the different types of fuel which are used to produce electricity in a particular jurisdiction. Normally the mix is expressed in terms of the proportion of each type within the overall amount of energy produced.

Transmission

The movement or transfer of electricity energy or natural gas over an interconnected group of lines and associated equipment between points of supply and points at which it is transformed for delivery to consumers, or is delivered to other, separate electric/gas transmission systems. Transmission of electricity is done at high voltages (50kV or higher in Ontario); the energy is transformed to lower voltages for distribution over local distribution systems.

Wind Power

Electricity produced from a system of airfoils or blades that spin a drive shaft to capture the kinetic energy of the wind.



Appendix E

MANAGEMENT ATTRIBUTE	1997 (IIPA REPORT)	2001 (EXTERNAL CONSULTANTS REPORT TO OPG)
Manager Accountability	- Lack of accountability by managers - No awareness of site specific goals	- Managers do not have ownership of their projects - No follow through on commitments
Lateral Working Relationships	- Unclear lines of authority and of accountability - Lack of teamwork	- Roles/responsibilities not clearly defined nor documented - Lack of teamwork
Managerial Practices	- Ineffective lines of communication - Gap between perceived and actual performance - Timeliness and resource limitations	- Ineffective management controls - No adherence for the achievement of milestones
Support of Subordinate Managers	- Bad news does not flow up - Problems solved at too low a level	- Workers are not encouraged to voice issues upward - No encouragement for innovation
Pickering A Culture	- Little focus on cross organizational cooperation - Employees lack accountability and commitment to quality	- Ineffective sharing of information - No cultural support of safety standards

Source: "Pickering A Return to Service Discussion Document," August 10, 2001, prepared for OPG by an external consulting firm, p. 4

Appendix F - Key Lessons Learned on Pickering A Return to Service

Key Lessons Learned #A:

- ☐ Project Scope Must be Fully Developed and Frozen

Unit 4 History:

- ☐ Piecemeal design process led to final work scope not being finalized until long after construction was started.
- ☐ Regulatory requirements were not included in initial scope of work.
- ☐ No contractor reviews of engineering.
- ☐ Over 8000 field change notifications (FCNs) during construction, 50% of which added to scope.

Unit 1 Approach & Status:

- ☐ All additions to the Unit 4 scope (from FCNs) and change orders have been reviewed for addition to the Unit 1 scope.
- ☐ All regulatory requirements have been included in the scope of engineering work.
- ☐ OPG has completed detailed field walk-downs to confirm engineering work.
- ☐ Contractors in preparing estimates have performed own walk-downs and constructability reviews.
- ☐ Fewer FCNs expected due to robust engineering

Key Lessons Learned #B:

- ☐ Project Budgets must be based on Completed Scope and a Defined Project Schedule

Unit 4 History:

- ☐ No due diligence of required project definition prior to establishing budget.
- ☐ Initial budget based on incomplete conceptual engineering resulting in drastic underestimation of cost, schedule and complexity.
- ☐ No availability of integrated project schedule to allow sequencing of work.
- ☐ No project specified/itemized budget for in-house project tasks

Unit 1 Approach & Status:

- ❑ Budget is being developed on basis of full scope definition of project including all internal and external work required.
- ❑ Engineering and basic Planning & Assessing of work completed prior to initial contractor man-hour estimates.
- ❑ Detailed integrated task schedule developed from contractor estimates to test 12 month project duration.
- ❑ Budget has been developed for in-house construction and support staff

Key Lessons Learned #C:

- ❑ Steps Precedent to Construction Must be Completed Before Construction Starts

Unit 4 History:

- ❑ Construction mobilization occurred well before any of the customary precedent steps – engineering, planning and assessing, scheduling of work, and material procurement – were completed

Unit 1 Approach & Status:

- ❑ The Unit 1 team identified significant prerequisite tasks that must be performed prior to the start of construction.
- ❑ Progress in completing Precedent Steps is being closely tracked

Key Lessons Learned #C1:

- ❑ Engineering must be complete before a construction contractor begins work in the field.

Unit 4 History:

- ❑ Engineering completed approximately 18 months after construction start and 6 months after projected end of construction

Unit 1 Approach & Status:

- ❑ Engineering is virtually complete – 860 of 866 final detail level drawings have been completed.
- ❑ \$60 million has been spent in engineering Unit 1 to ensure that design is more complete than at any time during the Unit 4 work.
- ❑ Engineering has been tested by contractors and is considered robust

Key Lessons Learned #C2:

- ❑ Planning and Assessing must be completed
 - P & A establishes detailed and coordinated construction work packages or CWPs as well as accurate bills of materials for the ordering of parts and equipment

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Unit 4 History:

- ❑ Lags in producing engineering resulted in additional compression of an already too short Planning and Assessing phase.
- ❑ P & A was deferred in large part until after construction started resulting in engineering on the fly, coordination problems, inefficiencies and unnecessary delays in the field

Unit 1 Approach & Status:

- ❑ Unit 1 team made commitment to completing Planning and Assessing prior to start of related construction tasks.
- ❑ P & A is currently behind schedule but will be substantially complete and sufficient to support start and initial months of construction

Key Lessons Learned #C3:

- ❑ Detailed Schedule must be completed and updated
 - Fundamental to management of a major construction project

Unit 4 History:

- ❑ Contrary to industry standards, work proceeded for months without an integrated baseline schedule.
- ❑ Once produced, the schedule was re-baselined 8 separate times, making it ineffective for gauging progress

Unit 1 Approach & Status:

- ❑ The Unit 1 team has made considerable progress in developing a detailed, integrated and logically-tied, baseline critical path schedule.
- ❑ Schedule should be in place by early May 2004 by which time all participants – Prime Contractors and internal OPG departments – should be able to sign off.

Key Lessons Learned #C4:

- ❑ Materials must be ordered, stored on-site and ready for delivery to workforce

Unit 4 History:

- ❑ Much of the work was delayed due to the unavailability of materials that were to be supplied by OPG.
- ❑ Lag in engineering and subsequent lack of Planning & Assessing was a major cause



Unit 1 Approach & Status:

- ❑ OPG Supply Chain reports that 70% to 80% of materials for the entire project are already available and specialty long-lead items are available or on order – work arounds have been used to pre-order materials prior to completion of final P & A.
- ❑ Completion of engineering and Planning & Assessing is allowing confirmation of bills of materials.
- ❑ Investments are being made in warehousing and staff to kit and deliver materials to the job in sequence with the schedule.
- ❑ Commitment to ensure all required materials are on site and kitted prior to each 3-month section of the schedule.

Key Lessons Learned #C5:

- ❑ OPG Operations and Maintenance must commit to assisting Prime Contractors

Unit 4 History:

- ❑ Permit system for contractor access to work sites used a daily sign-in, single window approach that was cumbersome and inefficient resulting in daily work crew wait times of 2-3 hours
- ❑ Likely delayed construction completion by as much as 3-5 months

Unit 1 Approach & Status:

- ❑ OPG Operations & Maintenance has primary responsibility for ensuring safety and integrity of plant and that work performed meets all licensing conditions.
- ❑ Within that context, O&M is seeking ways to increase efficiency and productivity. 4 Maintenance Authorities have been added, in addition to the permit window, who will also be able to issue work access permits and will be available 2 hours prior to each shift

Key Lessons Learned #C6:

- ❑ Contingency plans must be in place-
 - Project-related delays of varying magnitude occur frequently during every major construction project

Unit 4 History:

- ❑ Those contingency plans in existence for responding to delays were largely ineffective
- ❑ The baseline schedule and project control metrics required to identify and re-allocate resources to mitigate such delays were non-existent.

Unit 1 Approach & Status:

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- ❑ Project team is continuing to develop alternate strategies, communications plans and clear roles and responsibilities so that delays to the critical path of the schedule can be mitigated
- ❑ The detailed schedule and project metrics which are the central tools of contingency planning are in advanced stages of development

Key Lessons Learned #D:

- ❑ Project Metrics Must be Established for Tracking Work

Unit 4 History:

- ❑ Appropriate project control metrics were never effectively developed or applied
- ❑ Resulted in an inability to track the work or respond to problems in a coordinated manner

Unit 1 Approach & Status:

- ❑ A new project controls system is being implemented using tracking software
- ❑ Implementation of the new system will require attention for the duration of the project but it is already reporting more information than was ever the case on Unit 4

Key Lessons Learned #D1:

- ❑ Commodity based earned value of all construction work must be tracked
 - Success depends on being equipped with the tools to compare status with baseline at any given time

Unit 4 History:

- ❑ Work was gauged in a number of different ways at different times resulting in confusion as to progress and inability to verify status

Unit 1 Approach & Status:

- ❑ A stable Work Breakdown Structure is being established of codes for tracking of hours of work and commodities estimated, expended and installed
- ❑ This will allow the determination of earned value percent complete against hours of work expended
- ❑ Contractors are working with the project team to integrate the system

Key Lessons Learned #D2:

- ❑ Performance metrics must be established for OPG administrative staff

- OPG must subject its internal activities to metrics to enable identification of issues and problems

Unit 4 History:

- Metrics for OPG functional groups were not in place

Unit 1 Approach & Status:

- OPG functional departments are developing deliverables metrics to track progress that should enable correlation of cost and hours with efficiency and productivity
- By construction's start, it is expected that each department will have a performance indicator

Key Lessons Learned #E:

- OPG Project Management Must Improve its Performance

Unit 4 History:

- Lack of skills in this area was key to the project's deficiencies
- Project team failed to perform the role typically played by an owner in a multi-prime project
- When it tried to contract out the project management role, it did not give enough authority and it was late in the project

Unit 1 Approach & Status:

- It is Schiff's assessment based on observation of performance over the last several months, that the current OPG project management team is capable of successfully managing the project to completion
- The project scope, now that it has been engineered, is not considered abnormally demanding
- Some of the members of the team lived through the problems with Unit 4 and possess a critical knowledge of the pitfalls
- Key changes have been made to the Project Team to add expertise and depth
- An external advisor with nuclear construction expertise is mentoring the team and supporting the project manager on critical issues.

Key Lessons Learned #F:

- Effective Contracting Strategies Must be Developed

Unit 4 History:

- Contracting strategy was nebulous
- Procuring engineering on piecemeal basis through fixed-price purchase orders was not a viable mechanism

- ❑ The attempt to externalize project management mid-way through the project through the "Alliance Agreement" was deficient because it lacked strong provisions for project controls, contractor compliance, scope, modification and schedule revisions and did not include the engineering design function
- ❑ Each of the contractors worked on a time & materials basis with virtually no controls relating to billings

Unit 1 Approach & Status:

- ❑ Roles and responsibilities of project team, OPG internal departments and prime contractors have been better defined
- ❑ Discussions are ongoing with prime contractors as to issues which could present barriers to project performance
- ❑ Whatever model the contracts take, they will be based on accurate estimates and an integrated schedule and with appropriate controls available for billings
- ❑ The Project Team is seeking a form of control that would allow the Unit 1 Project to set a reliable budget.

Key Lessons Learned #G:

- ❑ Project Team Must Provide Accurate Information to Senior Management and the Board of Directors-
 - Senior management and the Board of Directors must have accurate information to hold the Project Team accountable

Unit 4 History:

- ❑ The evidence supports the view that senior management and the board of directors were not well informed about the status of the project and its problems
- ❑ There was no independent oversight with access to the Board on the project
- ❑ Data was filtered in essence through a "gate keeper" without independent verification

Unit 1 Approach & Status:

- ❑ Third-party oversight team, Schiff has been established to review progress with prime responsibility to report to board of directors
- ❑ Oversight Panel established with representatives from the board of directors and external members with experience in construction and nuclear to review Schiff's findings with the project management and to report to the Board.
- ❑ Accurate project control metrics for contractor and internal work being established
- ❑ Baseline schedule in advanced stage of development



Recommendations

Recommendation II.1

That OPG serve the people of Ontario as a steward of its core generating assets providing a diverse, cost competitive, stable supply of electricity at regulated prices.

Recommendation II.2

That the government of Ontario remain the sole shareholder of OPG.

Recommendation II.3

That OPG retain ownership of its nuclear, major hydro-electric, and fossil-fuel generating assets.

Recommendation II.4

That OPG withdraw from non-core businesses (including wind-power, solar, biomass and small hydro projects) in an orderly fashion to allow room for others better suited to these businesses.

Recommendation II.5

That OPG may, on its own or with partners, redevelop, enhance, and/or expand existing facilities that are part of its core assets.

Recommendation II.6

That OPG's role as a builder of new capacity not serve as a disincentive to new investors.

Recommendation II.7

That the Ontario Energy Board, acting as an independent body, approve the rate or rates at which the output of each OPG generating division is sold.

Recommendation II.8

That, for each generating division, the Ontario Energy Board base the rate or rates on cost of production plus a reasonable rate of return on capital that is comparable to the return earned by a regulated commercial company (or division of a company) with a similar business profile.

Recommendation II.9

That the Ontario Energy Board apply performance-based rate-making approaches to setting OPG's rates to drive better performance at OPG.

Recommendation II.10

That OPG explore joint ventures, partnerships and leases for the operation and maintenance of its core generating assets where it is in its commercial interests to do so.

Recommendation II.11

That, where appropriate, OPG make its land holdings available on commercial terms to other parties to develop new electricity generating facilities.

Recommendation III.1

That OPG remain a single, commercially oriented company under the Business Corporations Act (Ontario), that the current arrangement in which the Province does not guarantee OPG's debt continue; and that OPG be divided internally into two principal operating divisions, the nuclear division and the hydro/fossil division.

Recommendation III.2

That a separate management team led by a divisional Chief Executive Officer, accountable to the CEO of OPG, operate each division.

Recommendation III.3

That OPG be structured so that as many as possible of the operating functions necessary for the success of a division, including regulatory affairs, financial reporting and risk management, are



located within the division, and that each division assume or absorb all corporate costs and head office costs reasonably associated with its share of the business revenues of OPG.

Recommendation III.4

That the divisions each year produce detailed financial statements, and a management discussion and analysis of results, which are made public.

Recommendation III.5

That each of the divisions produce each year an annual five-year rolling business plan for the division, which will form the basis of the OPG business plan.

Recommendation III.6

That OPG as regulated company have a capital structure similar to other regulated commercial utilities.

Recommendation III.7

That as soon as practical the OPG Board present a plan, with timeframes, to the shareholder for reorganizing the company into two principal operating divisions and winding down non-core business units.

Recommendation IV.1

That the OPG board consist of up to 12 directors appointed by the Province and that the directors bring to the Board skills and experience in areas such as nuclear electricity generation, finance, environmental matters and human resource management.

Recommendation IV.2

That the Chair serve part-time and have no executive powers.

Recommendation IV.3

That Board members be remunerated in line with remuneration paid to members of boards of comparable private sector entities.

Recommendation IV.4

That when new directors are needed, a committee of the Board of OPG develop, for shareholder consideration, a list of Board needs and skills that is made public and is used by the committee to develop a roster of director nominees for shareholder consideration.

Recommendation IV.5

That instructions or similar directives, when given by the shareholder to OPG, be in writing and be given as a matter of public record.

Recommendation IV.6

That OPG each year certify and disclose senior officer employment terms, compensation, benefits and expenses.

Recommendation IV.7

That the Board issue a report each year on its priorities and progress and its conclusions as to how effectively the Company was governed during the prior year.

Recommendation IV.8

That OPG clearly define a mission and vision for the company, based on its role as steward of core generating assets and also reflecting such elements as:

- Environmental sustainability;
- Due regard to health, safety and community needs;
- Relative performance among peers; and
- Achieving its goals through a workforce committed to embracing the public trust around Ontario's publicly owned generating assets



Recommendation IV.9

That every year OPG prepare for Board and shareholder approval a rolling five-year business plan and that a summary of such plan be made public;

That each operating division prepare a similar plan on which the OPG business plan can be based; and

That OPG submit to the shareholder for approval any material capital expenditures not included in the approved OPG business plan

Recommendation IV.10

That the Board hold management accountable for pursuing and achieving company goals by:

- establishing annual objectives for the CEO reflecting the Company approved business plan;
- ensuring that a significant portion of compensation is performance based;
- aligning performance based compensation with such annual objectives;
- requiring the CEO to establish similar arrangements for the divisional Chief Executive Officers and the other senior officers of the divisions.

Recommendation IV.11

That OPG hire and compensate managers in line with market conditions for comparable utilities.

Recommendation IV.12

That throughout the organization, where possible, compensation be tied to individual, divisional and company performance

Recommendation IV.13

That OPG develop control systems around major capital expenditure and/or O&M programs including:

- robust controls and metrics to measure project value as expenditures are made;
- conditions for making major capital expenditure decisions around the degree of completeness of project scoping and engineering;
- the means by which the board can be assured that all alternatives have been appropriately challenged before go-ahead authorizations are given for major expenditure programs; and
- the process by which follow-up reviews will be conducted in an independent manner to establish how actual performance compares to projected performance as estimated at the time of project approval.

Recommendation IV.14

That OPG examine its approach to information provided to the Board with respect to major projects and programs to ensure that the information provided by OPG to its Board includes a full assessment of risks associated with the decision and the timing of the decision.

Recommendation IV.15

That a Corporate Governance Officer be designated to assist OPG in managing governance related matters.

Recommendation IV.17

That management of divisions be based in the field at or near the assets for which the division is responsible.

Recommendation IV.18

That head office of OPG be reduced in size as much as possible as functions are moved to the two key operating divisions and, subject to cost-benefit analysis, be moved away from 700 University Avenue in Toronto.

Recommendation V.1

That OPG proceed with the project to return Pickering A Unit 1 to service.

Recommendation V.2

That the Board of OPG maintain the highest level of oversight for the duration of the project, including monitoring by third-party experts with direct accountability to the Board.

Recommendation V.3

That the Board of OPG wait until there is clear evidence of success on the Unit 1 Project before proceeding with any further development work on Unit 2 or 3.

Recommendation V.4

That the same level of due diligence applied on the decision to proceed with Unit 1, including a business case analysis, be repeated for each of Units 2 and 3